Grasses of Ontario

Agriculture
Canada

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The cover illustration is part of a stand of *Phalaris arundinacea* L., reed canary grass, growing beside the Rideau River in Ottawa, Ont.

Grasses of Ontario

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and
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Preface

It is altogether appropriate that at the beginning of this work tribute should be paid to the role of the senior author, Dr. William G. Dore, in its conception and preparation. The study of the grasses of Ontario has formed a major part of his professional activities for the past 30 years and his breadth of knowledge of this subject will probably never be surpassed.

As is explained in the introduction, Dr. Dore began work on Ontario grasses in 1947. His abundant energy, consistently displayed in the field and herbarium, was restrained only by heart attacks in the early 1970s. By that time he had prepared the basic treatment from which the present publication stems. Although from then until his retirement in 1976 Dr. Dore's official duties were directed to other aspects of grass systematics, he retained an active interest in the progress of the work. Certainly the task of extending it and revising it for publication has been made immeasurably more worthwhile by knowing that his initial work was soundly based on extensive field studies (his own collections of grasses from Ontario number more than 10 000) and on a thorough review of the older literature.

J. McNeill

Introduction

The grass family (Gramineae or Poaceae[1]) is one of the largest families of flowering plants and one that is well represented in the Canadian province of Ontario. Moreover, it is the group of plants that has by far the greatest economic importance to man. Only the legume family (Leguminosae or Fabaceae) is even a remote rival in this regard. The importance of the cereal grains, such as wheat, corn, barley, oats, rice, and millet, as food for man and domestic animals is readily appreciated. Members of the family are also the most important constituents of natural and improved grazing land and the most important forage crops. Grasses are the usual basis of lawns and playing fields and there are several ornamental species. Weedy grasses occur, and some of these such as wild oats have become of great importance because of the difficulties of chemical control when they are growing with cereal crop species.

This work attempts to provide an account of the genera, species, and infraspecific taxa[2] of the Gramineae that occur in Ontario, either as native or as introduced plants. The main emphasis is on indicating accurately the grasses in the province and on describing in detail their known distribution. The book is directed toward all those whose work or relaxation involves knowledge of these grasses, including students of agriculture and biology, and others with a keen interest in the natural environment. Because of the central position of Ontario in the southern half of Canada, we realize that this audience will probably include many in adjacent provinces and states, as well as grass specialists in other parts of the world. We have not included discussion of the more general aspects of grass morphology and taxonomy; these are dealt with in other works. However, we have tried through an extensive, though by no means exhaustive, bibliography to direct the interested user to a selection of these for reference if required.

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[1] The names of plant families are derived by adding the suffix *-aceae* to the stem of the nomenclatural "type-genus" of the family (in this case *Poa*). However, for eight families alternative forms, sanctioned by long usage, are permitted. One of these is Gramineae for the grass family, and this is the name that we shall generally use.

[2] Taxon (pl., taxa) means "taxonomic group" and is a general term that can be used without specifying the rank.

The investigations on which the book is based were started in 1947 when the senior author was on the faculty of the Ontario Agricultural College, Guelph. The intention then was to provide a general reference work on the local grasses for students specializing in agricultural botany. The study was continued intermittently over subsequent years at the Plant (now Biosystematics) Research Institute, Central Experimental Farm, Ottawa, where the facilities of herbarium and library and those for experimental research allowed the scope to be broadened.

There have been three main sources for the work. The primary data base lies in the numerous specimens preserved in various herbaria, but particularly that of the Canada Department of Agriculture, Ottawa (DAO)[3], and to a somewhat lesser degree those of the National Museum of Natural Sciences, Ottawa (CAN), the University of Toronto (TRT), and the University of Guelph (OAC). Secondly, existing taxonomic treatments in manuals and research publications have been appraised and the published reports on grasses in Ontario have been critically assessed and substantiating specimens sought. Finally, the senior author's personal observations in the field have contributed to an understanding of the species and their variation and have added substantially to the available information on distribution.

Knowledge of the flora of an area even as relatively well explored as Ontario is continually increasing. In preparing an account such as this one, it is necessary at some time to draw a line and admit no new information. This manuscript was completed in November 1975 and in general it reflects the knowledge of Ontario grasses available at that time. There are two important exceptions, however. The distribution maps were originally plotted between 1966 and 1971, and since that time additions have been made only for some of the rarer or more localized species. On the other hand, no fewer than four additional genera and 14 additional species of grasses were found in Ontario in the two years after the manuscript was prepared. Thanks to the cooperation of their discoverers, we have been able to incorporate these in this account.

Grass morphology and terminology

If grasses are to be known well and if the identification keys are to be usable, the basic structure of the floral and vegetative parts must be understood. This understanding is more important with grasses than with most other families of flowering plants. Fortunately, there are a number of excellent publications that describe and illustrate grass structure and explain its terminology. The most comprehensive are probably F. W. Gould's *Grass Systematics* (1968) and W. E. Booth's *Agrostology* (1964). Agnes Chase's *First Book of Grasses* (1959) and H. D. Harrington's *How to Identify Grasses and Grasslike Plants* (1977) are also useful, as is the introductory material in the *Manual of the Grasses of the United States* (Hitchcock and Chase 1951) and in the paperback *Grasses*[4] by C. E. Hubbard (1968).

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[3] Herbarium abbreviations follow the internationally accepted standard given in *Index Herbariorum* (Holmgren and Keuken 1974), in which information on the world's herbaria is summarized.

Taxonomic treatment

Users of this publication should have access to Hitchcock and Chase's *Manual* (1951), which includes almost all the species that occur in Ontario. Reference to *The New Britton and Brown Illustrated Flora* (Gleason 1952), with its detailed line drawings of most species, would also be helpful. These manuals, although now outdated in some details, remain invaluable reference works. This book is generally planned to build on these works rather than to replace them; this is especially the case with Hitchcock and Chase's *Manual*. For ready reference to it, we have arranged the genera in the same sequence, although we recognize that modern research has shown that the classification into subfamilies and tribes upon which it is based is in many respects unsatisfactory (*see* Gould 1968).

Knowledge of many of the genera of grasses has also increased substantially since the publication of the *Manual*, and where there is good evidence for a different taxonomic treatment from that adopted by Hitchcock and Chase (1951), our account reflects the more recent research. There are other groups in which the variation is still poorly understood, and existing taxonomic treatments are to some extent unsatisfactory. For these groups we have tended to follow the *Manual* treatment, but have noted the nature of the variation found in Ontario material. In the course of the work, it seemed desirable to recognize a few new infraspecific taxa, and it was also necessary to provide several new names for existing entities. These taxonomic and nomenclatural changes have been published separately (McNeill and Dore 1977).

Keys, descriptions, and illustrations

Identification keys are provided to the genera, to the species within each genus, and to the main infraspecific taxa. To use these effectively a lens of about ×10 magnification is needed. This should contain a grid or be fitted with a scale to permit measurement or fair estimation to 0.1 mm. To aid confirmation of identification, generic descriptions are provided. These reflect the characteristics common to the species occurring in Ontario and do not necessarily apply to the genus as a whole. We have not included formal descriptions of the species, which are usually available in Hitchcock and Chase (1951), but instead have often noted the outstanding diagnostic characters, particularly those noticeable in the field. Moreover, the keys to species have somewhat more extensive leads than those provided in many other works. Photographs of individual florets or grains, uniformly magnified to ×5, are provided for almost all the species. In addition to serving as an aid in confirming identification, these may be useful to seed analysts and others who receive only these parts for identification.

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[4] This title is misleading in that the book restricts itself to the British Isles; nevertheless, with its detailed descriptions, excellent illustrations, and low cost, it is very useful for information on the many grass species introduced into Ontario from Europe.

The line drawings, showing the overall habit of a few grass species, were made about 1914 by Margaret Hearle (the late Mrs. C. W. Leggatt) when she was an assistant in botany at the Ontario Agricultural College, Guelph.

Geographical distribution

Emphasis has been placed on geographic occurrence. Ontario, situated almost centrally in Canada, comprises a land area of considerable size, about 1500 × 1500 km, and is well suited to phytogeographic study. No single species extends uniformly over the whole province and limiting boundaries cut variously across the area. The position and conformation of these boundary lines, especially for native species, is of considerable biological interest. Because of climate, a greater number of taxa are to be found in the southern portion of the province and have the main part of their range farther south in the United States. Only a few with subarctic affinities are confined to the north and have a southern limit within Ontario.

The physiographic events that followed the withdrawal of the great Wisconsin Ice Sheet have greatly influenced the present-day pattern of occurrence of native species. The extent and sequence of land and the climatic changes, still inadequately known, have had important effects on the speed and direction of migration of different species. For alien species, on the other hand, occurrence is related more to the history of settlement and to the chances of introduction during the past century or two. Evidence emerges that the distribution of native species has also been influenced by human activities, both in prehistoric time and since European settlement.

The maps of distribution present the facts of known occurrence. Some of the maps may seem to have a sufficient number of plotted records to give a reliable picture of natural occurrence, but this assumption is often misleading. In many areas of the province much work still needs to be done to obtain additional information on the presence or absence of most species. For more than a century a diligent corps of interested collectors, active intensively or intermittently, have contributed to the store of distributional statistics now at our disposal. It is from their work, often anonymous except for the collector's name on the herbarium label, that the solid map dots (•) derive. Published and sight records, unsubstantiated by specimens, are indicated by open circles (○). Other symbols, used occasionally, are explained in the legends to the maps.

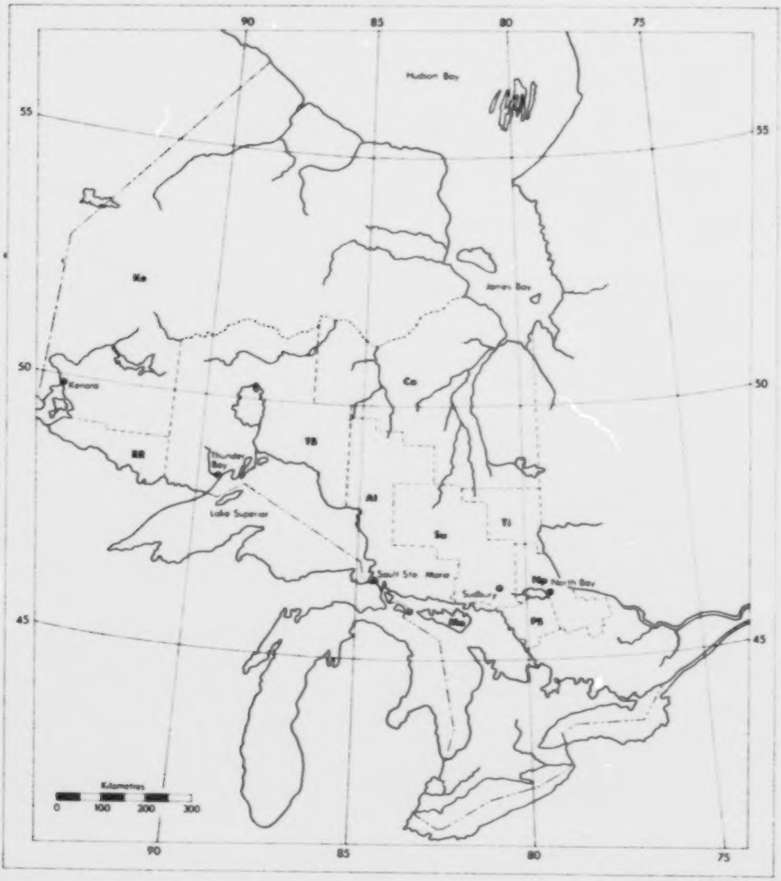
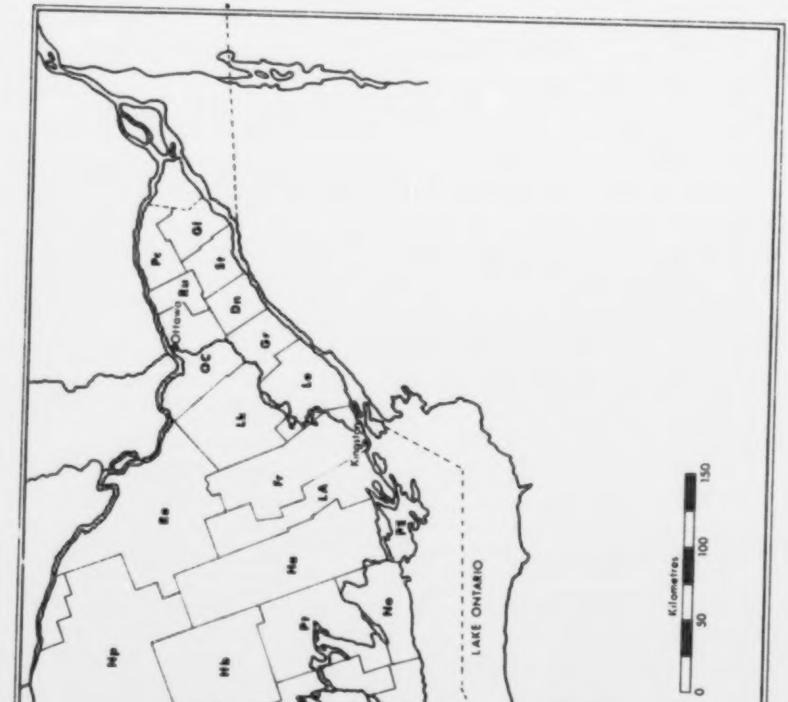

90
85
80
75
55
50
45
Hudson Bay
James Bay
Ke
Co
Kenora
RR
Thunder Bay
TB
Lake Superior
Al
Su
Ti
Sault Ste. Marie
Sudbury
Np
North Bay
PS
Ma
Kilometres
0
100
200
300

Fig. 1. Map of Ontario showing important centers and the boundaries of the administrative districts in northern Ontario.

Al—Algoma
Co—Cochrane
Ke—Kenora
Ma—Manitoulin
Np—Nipissing
PS—Parry Sound
RR—Rainy River
Su—Sudbury
TB—Thunder Bay
Ti—Timiskaming



LAKE ONTARIO
LAKE ERIE
LAKE HURON
GEORGIAN BAY
Kilometres
0
50
100
150
Ottawa
Kingston
Toronto
Hamilton
Guelph
Waterloo
Cambridge
London
Windsor
Pc
Ol
Ru
Sr
Dn
OC
Gr
Le
Lk
Fr
LA
Re
Ha
PE
Np
Hb
Pt
No
Vi
Dr
Mu
Yk
PS
Pl
Si
Ht
HW
Ng
Df
We
Br
HN
Gy
Ox
Pr
Hu
El
Ml
Lm
Kt
Es
Su
Al
Ma

Fig. 2. Map of southern Ontario showing important centers and the boundaries of the counties and regional districts or municipalities. Abbreviations are as follows:

Al—Algoma
Bt—Brant
Br—Bruce
Df—Dufferin
Dn—Dundas
Dr—Durham
El—Elgin
Es—Essex
Fr—Frontenac
Gl—Glengarry
Gr—Grenville
Gy—Gray
HN—Haldimand-Norfolk
Hb—Haliburton
Ht—Halton
HW—Hamilton-Wentworth
Ha—Hastings
Hu—Huron
Kt—Kent
Lm—Lambton
Lk—Lanark
Le—Leeds
LA—Lennox & Addington
Ma—Manitoulin
Mi—Middlesex
Mu—Muskoka
Ng—Niagara
Np—Nipissing
No—Northumberland
OC—Ottawa-Carleton
Ox—Oxford
PS—Parry Sound
Pl—Peel
Pr—Perth
Pt—Peterborough
Pc—Prescott
PE—Prince Edward
Re—Renfrew
Ru—Russell
Si—Simcoe
St—Stormont
Su—Sudbury
Vi—Victoria
Wa—Waterloo
We—Wellington
Yk—York

For the few species where there is reason to believe that the known records are relatively complete, a limiting boundary has been placed around the dots to define the probable overall geographic limit. These limits should not be taken to imply that the species is to be found ubiquitously within the boundary. It is not possible for maps of this scale to reflect finer distributional patterns imposed by edaphic or local climatic factors.

Unless otherwise stated, the distribution maps show only the occurrence of the taxon within Ontario. In a few cases, records from outside Ontario are also included. These maps, which have a legend to this effect, are usually of species whose distribution beyond Ontario is particularly interesting. The distribution of grasses in adjacent states can be obtained in varying detail in the following works: the New England States (Seymour 1969), New York (Smith 1965), Ohio (Weishaupt 1967), Michigan (Voss 1972*b*), Wisconsin (Fassett 1951), and Minnesota (Lakela 1965). Less immediately relevant to the Ontario distribution are the accounts of the grasses of Illinois by Mohlenbrock (1972, 1973) and of Iowa by Pohl (1966). No correspondingly detailed works exist on the grasses of the adjacent Canadian provinces of Manitoba or Quebec.

Discussion in the text of the ranges of distribution in Ontario refers to the counties and regional municipalities of the southern part of the province and the districts in the north. The geographical boundaries of these administrative areas and the position of some major centers are shown in Figs. 1 and 2.

Scientific names and synonyms

Different taxonomic works sometimes use different scientific names for the same species or other taxon. The application of scientific names is governed by the *International Code of Botanical Nomenclature* (Stafleu et al. 1978). The *Code* states that "each taxonomic group with a particular circumscription, position, and rank can bear only one correct name, the earliest that is in accordance with the Rules, except in specified cases." Thus, some names are incorrect because the Rules have not been followed accurately. In other cases different names are used because of differences in the taxonomic treatment adopted, such as when one species is included within another, when it is moved to a different genus, or when it is reduced to the level of a subspecies or variety.

An example of the first situation is that of little love grass, for which the correct scientific name is *Eragrostis minor* Host. The widely used *E. poaeoides* Beauv. is incorrect (*see* McNeill and Dore 1977) and is listed in this work as a synonym. In the other situation, names that we treat as synonyms might be correct if a different taxonomic treatment was adopted. For example, we recognize the genus *Torreyochloa* and hence the correct name, for us, of the one Ontario species is *T. pallida* (Torrey) Church. For

Hitchcock and Chase (1951) who included it in *Glyceria*, it is *G. pallida* (Torrey) Trin., whereas for those who transfer the *Torreyochloa* group of species to *Puccinellia*, it must be called *P. pallida* (Torrey) R. T. Clausen. Although in this example the epithet *pallida* is retained in all three names, this is not always the case.

In this work we list synonyms only when one of the basic manuals (*see* Appendix III), uses a different name from that which we believe to be the correct scientific name for the taxon[5]. These synonyms appear in parenthesis immediately after the accepted name; others that have been widely used are sometimes referred to in the text. All names mentioned are included either in the index to scientific names or in the index to common names.

Hitchcock and Chase (1951) provide in an appendix an almost complete listing of synonyms, each with its place of publication. Appendix II of the present work provides a similar list of those names to which we have had occasion to refer, but which are not included in Hitchcock and Chase. With these two appendixes, details can be traced of the original publication of almost all names used for Ontario grasses.

Abbreviations

Taxonomic botanists often use extremely abbreviated forms for the names of the authors who have published plant names (the "authorities" that follow the name). Unless a full glossary is provided, extreme abbreviations can be confusing[6] even to the informed reader. Moreover, such a glossary often takes up as much space as the abbreviations save. In a reaction against such esoterica as BSP, G1., H. & A., and Mx., some journals now require that all names be spelled out in full.

We have not felt it necessary to go to this length but have adopted as a standard the abbreviations used by *Flora Europaea* (*see* Tutin et al. 1976, p. 413–430), partly because of its wide coverage (even for use in a work on Canadian grasses) and partly because of the principles upon which its abbreviations of authorities are based. These are as follows: (i) abbreviations must provide a net saving of more than one space; (ii) for any one author the same abbreviation is always used; (iii) no two authors may have the same abbreviation; (iv) in selecting abbreviations a prime criterion is avoidance of possible confusion with other authors on a world basis (i.e., including those that have not published on European flowering plants). This last criterion results in a form such as "A. Gray," which may seem unnecessary to some, but which avoids possible confusion of Asa Gray with the earlier (and also prolific) S.F. Gray.

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[5] In a very few cases, principally under *Agropyron* and *Elymus*, whose generic limits are controversial, we have also included, as synonyms, names that some authors have recently adopted for the species.

[6] For example, Gleason (1952) expands *Setaria viridis* var. *ambigua* (Guss.) Coss. & Dur. (used by Hitchcock 1935, and others) to Cosson & Durand; however, Dur. stands here for Michel Charles Durieu de Maisonneuve, not Elias Magliore Durand or any of at least four other Durands who have published plant names!

These criteria generally permit the full name to be reconstructed readily by anyone with access to the most basic botanical literature. For this reason we do not repeat the full key to abbreviations that appears in *Flora Europaea*. However, Appendix II provides a key to the relatively few abbreviations of authors names that have been used here but are not in the *Flora Europaea* list.

Acknowledgments

Our debt to the many botanists and naturalists who have collected grasses in Ontario during the past century and a half has already been mentioned. We are greatly indebted also to the directors and curators of the many herbaria from which specimens have been borrowed or information obtained. Our professional colleagues in the Biosystematics Research Institute have assisted in numerous ways over many years. We are grateful to all of them and in particular to Dr. R. J. Moore for chromosome number observations, to Dr. B. Boivin for biographic and bibliographic information, and to Dr. M. E. Barkworth for various suggestions on the text, notably in improving some of the identification keys. These keys have also benefited from the comments of other botanists who used earlier versions, such as Dr. V. Harms (Univ. of Saskatchewan, Saskatoon), Dr. P. W. Ball (Erindale College, Univ. of Toronto), and Dr. A. A. Reznicek (Univ. of Michigan, Ann Arbor). To the last named and to Mr. P. M. Catling and Mr. J. L. Riley (Univ. of Toronto), we are also grateful for making available, in advance of publication, details of their discoveries of several grasses new to Ontario. Dr. G. W. Argus and Mr. D. White (National Museums of Canada, Ottawa) have also assisted us in drawing attention to new or doubtful records of grass species in Ontario. Professor V. H. Heywood (Univ. of Reading, England) kindly provided some information from volume 5 of *Flora Europaea* in advance of its publication.

Dr. A. Löve (San José, California) gave us information on new combinations in the Triticeae.

The vagaries of our handwriting have been mastered by many typists at different times and we acknowledge their services with thanks, along with those of Mrs. Marion Kokko and Mr. M. Sarazin, who helped in map preparation and of Mlle J. Desjardins, who assisted by checking some of the typescript and by beginning the indexes. The great bulk of the work of checking and indexing was undertaken by Miss Gail Bebee, and to her we are especially grateful.

Taxonomic treatment

Key to genera

1. Spikelets proliferous, bearing vegetative buds or plantules instead of fertile florets
  2. Ligules < 1 mm long, truncate; glumes 3.5–5.5 mm long; distinct awn-pointed lemmas present within the glumes .... 2.11. ***Festuca rubra*** var. ***prolifera*** (p. 73)
  2. Ligules (1-) 2–5 mm long, acute; glumes 2–3 mm long; distinct lemmas absent, awnless basal scales or leaves of plantules immediately within the glumes .... 9.9. ***Poa bulbosa*** (p. 131)
1. Spikelets floriferous, without vegetative buds or plantules
  3. Spikelets unisexual, the staminate and pistillate conspicuously different, in separate inflorescences or separate parts of one panicle
    4. Pistillate spikelets awned, shortly pedicellate, arranged above the staminate but both in a single large terminal panicle; staminate spikelets 1-flowered, pedicellate, pendulous, arranged singly; native or planted on shores or in shallow water .... 65. ***Zizania*** (p. 405)
    4. Pistillate spikelets awnless, sessile, in many rows on a woody axis (cob) in the leaf axils, separate from the terminal staminate panicle; staminate spikelets 2-flowered, sessile or subsessile, arranged in pairs on the rachis of the spreading branches; cultivated cereals .... 78. ***Zea*** (p. 513)
  3. Spikelets bisexual or occasionally some sterile, rarely unisexual and then staminate and pistillate not conspicuously different nor widely separated in the inflorescence
    5. Spikelets all with a single fertile floret, with or without reduced florets below the perfect one (for opposing lead, *see* p. 24)
      6. Spikelets in pairs, usually 1 sessile or subsessile and 1 pedicellate; pedicellate spikelet usually reduced or rudimentary, occasionally represented by pedicel alone; lower glume longer than and tightly clasping or enclosing upper glume; lemma of fertile floret membranous, much thinner than lower glume
        7. Both spikelets of the pair similar, fertile, and pedicellate; pedicels glabrous; glumes long-hairy; culm internodes hollow; ornamental "plume grass" .... 74. ***Miscanthus*** (p. 499)
        7. One spikelet sessile and perfect, the other pedicellate and staminate or reduced; pedicels long-hairy; glumes not hairy; culms solid
          8. Racemes with 6–10 fertile spikelets, solitary or few, digitately arranged at end of culm or culm branches; rudimentary floret present, neuter; native perennials .... 75. ***Andropogon*** (p. 501)
          8. Racemes with 2–5 fertile spikelets, numerous in an elongate panicle
            9. Pedicellate spikelet staminate; large cultivated annuals or weedy perennials .... 76. ***Sorghum*** (p. 507)
            9. Pedicellate spikelet entirely lacking from top of pedicel; native perennials .... 77. ***Sorghastrum*** (p. 510)

6. Spikelets in pairs or not; lower glume shorter than or equal to upper glume, rarely absent, not clasping or enclosing it; lemma of fertile floret never much thinner than lower glume, herbaceous, cartilaginous or chartaceous and shiny

10. One or more staminate or sterile florets present below the fertile one, sometimes reduced to small lemmas; occasionally only 1 glume present and then lemma of sterile floret appearing as upper glume; lemma of fertile floret often cartilaginous or ligneous and shiny, always so if glume single

11. Spikelets disarticulating above the glumes; imperfect florets usually 2, if 1 then always staminate with lemma and palea similar to those of fertile one; lemma of fertile floret herbaceous, not enclosing ± membranous palea

12. Imperfect floret 1, staminate; lemmas 8–10 mm, the lower long-awned .... 35. ***Arrhenatherum*** (p. 262)

12. Imperfect florets 2, sterile, or if staminate, lemmas awnless; lemmas less than 6 mm long

13. Lemmas of sterile florets much shorter than that of fertile floret; inflorescence greenish, pale or purple-tinged, appearing in mid or late summer; foliage not flavored or scented .... 63. ***Phalaris*** (p. 394)

13. Lemmas of sterile florets equaling or exceeding that of fertile floret; inflorescence golden brown, appearing in May or June; foliage bitter-tasting when fresh, sweet-scented when dry

14. Glumes equal in size and shape, broad, but not wrapped around the florets; lower florets staminate, with broad acute lemmas; panicle open; basal leaf blades much longer than those of the culm and appearing later in the season, hairless .... 61. ***Hierochloë*** (p. 387)

14. Upper glume much longer than the lower, wrapped around the florets; lower florets neuter with narrow lemmas 2-lobed at apex; panicle spike-like; basal and culm leaves similar, pubescent .... 62. ***Anthoxanthum*** (p. 392)

11. Spikelets disarticulating below the glumes; imperfect floret 1, usually sterile, rarely staminate, with lemma dissimilar to that of the fertile one; lemma of fertile floret shiny, cartilaginous to ligneous, with inrolled edges enclosing palea of similar texture

15. Spikelets not surrounded or subtended by bristles or prickles but sometimes stiffly hispid or bristly on the glumes and sterile lemmas; ligule of hairs or membranous or absent; inflorescence an open panicle or composed of digitate spikes

16. Spikelets stiffly hispid, with coarsely awn-tipped glumes or sterile lemmas; ligule absent .... 70. ***Echinochloa*** (p. 470)

16. Spikelets often pubescent but not coarsely hispid, awnless

17. Lemma and palea of fertile floret cartilaginous, flexible, usually dark colored, with membranous margins; ligule membranous; lower glume minute or absent

18. Spikelets in pairs, short-stalked, and appressed to one side of the digitate racemes .... 66. ***Digitaria*** (p. 413)

18. Spikelets solitary at the ends of long branchlets in a very lax panicle .... 67. ***Leptoloma*** (p. 419)

17. Lemma and palea of fertile floret ligneous, rigid, usually pale

straw-colored, with thick inrolled margins; ligule a row of hairs or absent

19. Spikelets in pairs, subsessile on one side of the terminal and lateral spike-like racemes; lower glume absent .... 68. ***Paspalum*** (p. 421)
19. Spikelets not regularly paired, arranged in a panicle; both glumes present .... 69. ***Panicum*** (p. 423)

15. Spikelets with one to several bristles or prickles below or surrounding; ligule a row of hairs
20. Panicle of a few bur-like spikelets .... 73. ***Cenchrus*** (p. 496)
20. Panicle slender, spike-like
21. Spikelets falling free from bristles, leaving them on the panicle axis; weeds or grain plants .... 71. ***Setaria*** (p. 482)
21. Spikelets falling with bristles attached, leaving a bare axis; ornamental garden grasses .... 72. ***Pennisetum*** (p. 495)

10. Staminate or sterile florets absent, or occasionally rudimentary structures present above the fertile floret; lemma never cartilaginous or ligneous and shiny
22. Spikelets sessile or subsessile on the rachis of the main axis or of primary branches, forming 1 or more spikes
23. Spikelets 3 at each joint, the lateral ones sterile or reduced to awns, the joints alternating at opposite sides of the rachis .... 26. ***Hordeum*** (p. 218)
23. Spikelets not in threes, all fertile, arranged on one side of the rachis
24. Spike solitary; glumes absent or obsolete; stigma 1; leaf blades involute, wire-like .... 28. ***Nardus*** (p. 231)
24. Spikes several, arranged digitately or laterally on the main axis; glumes present; stigmas 2; leaf blades flat
25. Lemma 3-awned; leaf sheaths pubescent; one sterile floret above the fertile floret; ligule short, of stiff fused hairs .... 60. ***Bouteloua*** (p. 385)
25. Lemma blunt or with a single short sharp point; leaf sheaths hairless; no sterile floret present
26. Spikes arranged digitately at the apex of the stems; ligule a row of long hairs .... ***Cynodon*** (p. 376)
26. Spikes arranged singly on lateral branches of the main stems
27. Glumes broad, inflated, with abrupt short points, equal in length; soft, tufted plants; ligule long, membranous .... 58. ***Beckmannia*** (p. 378)
27. Glumes slender, not inflated, awned, the upper longer than the lower; coarse plants with heavy rhizomes; ligule a row of short hairs .... 59. ***Spartina*** (p. 380)

22. Spikelets stalked, sometimes shortly so, arranged in open or dense and spike-like panicles or racemes, rarely sessile and then ± remote and not in a spike
28. Palea equaling the lemma and of similar chartaceous texture; glumes absent .... 64. ***Leersia*** (p. 399)
28. Palea smaller than the lemma and enclosed in it, often membranous, rarely absent; at least 1 glume present
29. Lemmas firm, harder than the glumes, embracing the palea;

florets dorsally compressed or terete; tufted grasses without rhizomes or stolons

30. Lemma with 3-partite awn; ligule a row of short hairs; low-growing annuals, rarely perennials .. 54. ***Aristida*** (p. 364)

30. Lemma awnless or with an unbranched awn; ligule membranous; perennials

31. Lemma awnless, hairless; spikelets 3–4 mm long; plants more than 50 cm high with broad soft leaf blades .... 51. ***Milium*** (p. 350)

31. Lemma awned (awn sometimes caducous), finely pubescent on back; plants less than 50 cm high, or if higher, spikelets 6–9 mm long or else leaf blades coarse and becoming narrowly involute

32. Lemma with a hard, firm, persistent awn more than 10 cm long; lemma body cylindrical, 10–20 mm long with sharp bristly callus more than 3 mm long .... 53. ***Stipa*** (p. 361)

32. Lemma with a delicate, generally deciduous awn, less than 2 cm long, lemma body elliptical, 2–9 mm long with a short blunt callus .... 52. ***Oryzopsis*** (p. 353)

29. Lemmas as thin as or thinner than the glumes; florets generally compressed laterally

33. Lower glume absent; upper glume coriaceous, completely enfolding the thin lemma and small palea .... 55. ***Zoysia*** (p. 371)

33. Both glumes present, herbaceous, the upper not enfolding a herbaceous lemma or palea

34. Spikelets, exclusive of awns, 8 mm or more long

35. Panicle densely flowered and spike-like; glumes as long as the lemma; lemma awnless or essentially so; coarse rhizomatous grass of sand beaches .... 39. ***Ammophila*** (p. 282)

35. Panicle slender with few spikelets; glumes short or obsolete; lemma tapering into a long awn; tufted grasses of woodland .... 50. ***Brachyelytrum*** (p. 347)

34. Spikelets, exclusive of awns, 1–7 mm long

36. Inflorescence a dense, cylindrical, elliptical or ovate, uninterrupted, spike-like panicle with spikelets on very short pedicels

37. Perennials; spikelets flattened; glumes united in lower part, fringed on keel, awnless or awn-pointed

38. Lemma awnless .... 46. ***Phleum*** (p. 315)

38. Lemma awned from midback .... 44. ***Alopecurus*** (p. 307)

37. Annuals; spikelets not conspicuously flattened; glumes separate, not fringed on keel

38A. Glumes awnless, shorter than the lemma .... ***Crypsis*** (p. 342)

38A. Glumes awned, longer than the lemma

39. Glumes with a long fine hairless awn; panicle elongate; spikelets readily falling; weeds .... 45. ***Polypogon*** (p. 314)

39. Glumes with a featherlike hairy awn-point; panicle ovate; spikelets persistent; garden plants .... 47. ***Lagurus*** (p. 321)

36. Inflorescence a lax open or contracted panicle with spikelets on evident pedicels, if panicle contracted and spikelike, then more or less interrupted at base

40. Ligule a row of hairs; lemma awnless

41. Pericarp expanding, loosened from the seed by wetting, or enlarged into a firm yellowish body at maturity; palea splitting down the centre; lemma hairless on the callus; annuals or tufted perennials .... 49. ***Sporobolus*** (p. 337)

41. Pericarp firmly adhering to the seed; palea not splitting; lemma with a fringe of hairs from the callus about half as long as the lemma; coarse perennials with long hard rhizomes 40. ***Calamovilfa*** (p. 284)

40. Ligule membranous, but sometimes short, firm and ciliate; lemma awned or awnless

42. Callus of lemma with a fringe of fine hairs at least one-quarter the length of the lemma

43. Lemma awned from back; rachilla prolonged, bearded; collar of leaf sheath glabrous; ligule membranous; upper glume 3-nerved .... 38. ***Calamagrostis*** (p. 273)

43. Lemma awnless; rachilla not prolonged beyond the palea; collar of leaf sheath with tufts of soft hairs at sides; ligule a row of fine hairs fused together at base; upper glume 1-nerved .... 40. ***Calamovilfa*** (p. 284)

42. Callus of lemma hairless or with a few very short hairs; upper glume 1-nerved

44. Spikelet disarticulating below the glumes, leaving naked pedicels; rachilla prolonged as a slender bristle extending for more than one-half the length of the apparently 1-nerved palea; floret on a short recurved stalk, 0.2–0.4 mm long; stamens usually 1 .... 42. ***Cinna*** (p. 300)

44. Spikelet disarticulating above the glumes, the empty glumes remaining on the branchlets for some time after maturity; rachilla not prolonged; palea 2-nerved; florets sessile; stamens 3

45. Spikelets 4–6 mm long; glumes awnless, much shorter than the lemma and palea .... 43. ***Arctagrostis*** (p. 305)

45. Spikelets 1–3.5 mm long

46. Glumes awnless, equal to or longer than the lemma; lemma and palea loosely surrounding grain at maturity; lemma awnless or awned from back; rhizomes when present long, slender; leafy stolons sometimes present; culms smooth hairless .... 41. ***Agrostis*** (p. 288)

46. Glumes awned or not, the body shorter than

the lemma; lemma and palea closely embracing the grain at maturity; lemma awnless or awned from the tip; rhizomes when present short, scaly; leafy stolons absent; culms smooth, hispidulous or nodulose .... 48. ***Muhlenbergia*** (p. 322)

5. Spikelets with 2 or more perfect florets, or occasionally with only 1 and then the fertile floret basal in the spikelet with 1 or more imperfect florets above it

47. Spikelets sessile or subsessile on the rachis of the main axis or of primary branches, forming 1 to several spikes, these occasionally very short

48. Spikes several on branches of the main axis; spikelets arranged on one side of the rachis

49. Spikes few, digitately arranged; spikelets with 3–5 perfect florets; ligule membranous; plants annual .... 57. ***Eleusine*** (p. 375)

49. Spikes numerous, racemosely arranged

50. Spikelets erect with 6–12 perfect florets (or terminal with fewer); ligule membranous; plants annual .... 56. ***Diplachne*** (p. 373)

50. Spikelets spreading or recurved, with 1 perfect floret; ligule of short, stiff, fused hairs; plants perennial ..... 60. ***Bouteloua*** (p. 385)

48. Spikes solitary, terminal; spikelets alternating on opposite sides of the rachis

51. Spikelets 2–3 at each joint of the rachis

52. Plants sterile, anthers without well-formed pollen .... 25. ×***Agrohordeum*** (p. 216)

52. Plants fertile, anthers with well-formed pollen

53. Spikelets usually 2 at a joint, similar, 2- to 6-flowered .... 24. ***Elymus*** (p. 198)

53. Spikelets 3 at a joint, with the lateral ones sterile or reduced to awns, the central 1-flowered, fertile .... 26. ***Hordeum*** (p. 218)

51. Spikelets solitary at each joint of the rachis

54. Spikelets with the backs of one row of florets toward the rachis (back-on); glume next to the rachis wanting .... 29. ***Lolium*** (p. 223)

54. Spikelets with one side of both rows of florets toward the rachis (side-on); both glumes well-developed

55. Plants perennial, rhizomatous or tufted; native or introduced .... 21. ***Agropyron*** (p. 179)

55. Plants annual; cultivated cereals

56. Glumes ovate .... 22. ***Triticum*** (p. 193)

56. Glumes awn-shaped .... 23. ***Secale*** (p. 196)

47. Spikelets stalked, arranged in open or dense panicles

57. Lemma of lowest floret usually shorter than or reaching to the tips of the glumes; lemma awned with a bent awn from the back or between the teeth, occasionally awnless or with a short straight awn

58. Ligule a row of hairs; leaf sheaths generally hairy with tufts of longer hairs at collar .... 37. ***Danthonia*** (p. 267)

58. Ligule membranous; leaf sheaths glabrous or hairy but without any tuft of hairs at collar

59. Spikelets more than 12 mm long; annual weeds or cereals .... 33. ***Avena*** (p. 257)

59. Spikelets less than 12 mm long; perennials

60. Awns absent or rarely with a minute straight and nearly termi-

nal awn

61. Spikelets falling away completely from naked pedicels at maturity; lower glume very narrow; upper glume obovate .... 30. ***Sphenopholis*** (p. 236)

61. Glumes persisting on pedicels at maturity, with individual florets breaking away; glumes somewhat unequal, but the upper not obovate

  62. Panicle dense, spike-like; callus not hairy .... 29. ***Koeleria*** (p. 233)

  62. Panicle somewhat contracted, but branched, not spike-like; callus hairy .... 31. ***Trisetum*** (p. 241)

60. Awns present, bent

  63. Foliage hairless, sometimes scabrous; spikelets 2-flowered

    64. Both florets perfect with awned lemmas; spikelets 3–6 mm long .... 32. ***Deschampsia*** (p. 248)

    64. Lower floret staminate, long-awned; upper floret perfect, awnless; spikelets more than 7 mm long .... 35. ***Arrhenatherum*** (p. 262)

  63. Foliage hairy

    65. Spikelets 2-flowered; only the upper lemma awned with a short hook-like awn; lemmas 2–3 mm long; panicle contracted but not spike-like at maturity, usually pale purple or pink .... 36. ***Holcus*** (p. 266)

    65. Spikelets usually more than 2-flowered; awns on each lemma, not hook-like; lemmas 4–10 mm long; panicles sometimes ± spike-like, often green, greenish brown, or deep purple

      66. Lemmas 4–6 mm long .... 31. ***Trisetum*** (p. 241)

      66. Lemmas about 10 mm long .. 34. ***Helictotrichon*** (p. 261)

57. Lemma of lowest floret extending beyond the tips of the glumes; lemma awnless or with a straight awn arising at or just below the tip or between the terminal teeth

  67. Rachilla bearing long silky hairs that at maturity exceed glumes, giving a plume-like panicle; plant 1.5–4 m high, reed-like with leaf blades 2–3 cm wide; ligule a row of matted hairs .... 16. ***Phragmites*** (p. 166)

  67. Rachilla naked or short-pilose; plant less than 2 m high, not reed-like; leaf blades less than 2 cm wide

    68. Lemma conspicuously 3-nerved; spikelets in open panicles

      69. Ligule membranous; lemma hairless; soft creeping perennials, occurring rarely along northern coasts .... 12. ***Catabrosa*** (p. 156)

      69. Ligule a row of short hairs or absent

        70. Callus and nerves of lemma with conspicuous velvety hairs; lemma 2-lobed, with the midnerve excurrent between the lobes as a short awn

          71. Palea glabrous except for the scabrid nerves; panicle 15–35 cm long, lax, with long naked branches; spikelets 4- to 6-flowered; erect tufted perennials, occurring rarely in southern Ontario .... 19. ***Tridens*** (p. 176)

          71. Palea villous on the nerves; panicle 3–5 cm long, rather compact, with short branches bearing spikelets ± throughout; spikelets 2- to 4-flowered; jointed annuals of sandy

lakeshores in southern Ontario .... 20. ***Triplasis*** (p. 177)

70. Callus and nerves of lemma hairless; lemma acute to obtuse, awnless

72. Spikelets compressed, 3- to many-flowered; paleas persistent; low annuals; mainly weeds, occasionally creeping shoreline plants, in southern Ontario only .... 11. ***Eragostris*** (p. 145)

72. Spikelets subterete, 2- to 4-flowered; paleas falling with the florets; coarse perennials; rare alien ... 13. ***Molinia*** (p. 158)

68. Lemma 5- to many-nerved, the nerves sometimes obscure; ligule membranous

73. Spikelets crowded in one-sided clusters or spike-like panicles

74. Spikelets in clusters at ends of stiff naked panicle branches; sterile spikelets absent; leaf sheaths flattened .... 14. ***Dactylis*** (p. 161)

74. Spikelets in a slender spike-like panicle, with 1 pectinate sterile spikelet and 1 obscure fertile spikelet at each node; leaf sheaths terete .... 15. ***Cynosurus*** (p. 163)

73. Spikelets not in dense one-sided clusters or spike-like panicles

75. Lemmas laterally compressed, keeled on back, generally with fine webby hairs from callus .... 9. ***Poa*** (p. 114)

75. Lemmas rounded on back, with no webby hairs from callus

76. Palea colorless; upper glume obovate .... 30. ***Sphenopholis*** (p. 236)

76. Palea green or brown, at least on nerves; upper glume usually broadest at or below the middle

77. Nerves of lemma raised, equally prominent, ± equally spaced, not converging to apex

78. Lemma 7-nerved; upper glume 1-nerved; leaf sheaths closed, rupturing later; rhizomes present .... 6. ***Glyceria*** (p. 92)

78. Lemma 5-nerved; upper glume 3-nerved; leaf sheaths open; rhizomes lacking .... 5. ***Torreyochloa*** (p. 88)

77. Nerves of lemma not prominent, or not equally so, and not equally spaced

79. Nerves of lemma ± parallel, not converging at apex; lemma awnless, obtuse .... 4. ***Puccinellia*** (p. 82)

79. Nerves of lemma converging to apex; lemma often acute, awned or awnless

80. Lemma bifid at apex, usually awned from just below apex, between or in front of the teeth

81. Callus of lemma bearded with stiff straight hairs; grain free, hairless .... 18. ***Schizachne*** (p. 173)

81. Callus of lemma not bearded

82. All florets similar, fertile; grain adherent to palea, pubescent at summit; no haplocorms present at base of culms ...... 1. ***Bromus*** (p. 28)

82. Sterile florets present above the single fertile floret; grain free from palea and hairless at summit; haplocorms often present in basal culm internodes .... 17. ***Melica*** (p. 169)

80. Lemma entire at apex, awnless or awned from tip; grain hairless

83. Glumes and lemmas ± orbicular, cordate and cupped; spikelets nodding on delicate pedicels .... 10. ***Briza*** (p. 143)

83. Glumes and lemmas lanceolate, ± cuneate or truncate; spikelets not individually nodding

  84. Plants annual; weeds in southern Ontario .... 3. ***Vulpia*** (p. 791)

  84. Plants perennial

    85. Glumes and lemmas firm; ligule short, almost obsolete; widespread .... 2. ***Festuca*** (p. 55)

    85. Glumes and lemmas thin-membranous; ligule long, thin-membranous; species confined to wet northern tundra

      86. Spikelets with 2 to several flowers, usually 3–4; glumes shorter than the lemma; lemma blunt, hairless .... 7. ***Arctophila*** (p. 110)

      86. Spikelets 2-flowered; glumes as long as or longer than the lemma; lemma usually awn-tipped, with a few curved hairs at callus .... 8. ***Dupontia*** (p. 112)

1. Bromus L.

Perennial (mainly native) or annual (introduced), medium to tall grasses with leaf sheaths closed nearly to their top. Ligule membranous, less than 3 mm long. Inflorescence a loose panicle with spikelets more than 1 cm long, 3- to many-flowered, the florets breaking away readily at maturity leaving the glumes on the pedicel. Glumes acute, unequal in length. Lemmas awned (awn sometimes rudimentary) from between the 2-toothed or lobed apex, hairless or pubescent with straight hairs, never with a ring of stiff or webbed hairs at the base. Ripe caryopsis adhering to lemma and palea because of its gelatinous pericarp. Stigmas arising from a groove on the pubescent flattened apex of the ovary.

A. Spikelets strongly flattened laterally; lemmas sharply keeled ..... 16. ***B. carinatus***

A. Spikelets not strongly flattened; lemmas generally rounded on the back

B. Perennials; the flowering culm arising from the stem base of the previous year

C. Creeping rhizomes present; awns rudimentary or less than 3 mm long

D. Lemmas hairless, scabrous or shortly hirsute across the base or on the nerves; awns less than 1 mm long; sheaths usually hairless ..... 1. ***B. inermis***

D. Lemmas villous especially toward the margins; awns 2–3 mm long; sheaths pilose especially near the nodes .. 2. ***B. pumpellianus***

C. Plants tufted, lacking rhizomes; awns 3 mm long

E. Plants forming dense tussocks; leaves pubescent, the blades narrow, usually folded and 1–3 mm in diam; panicle narrow, the branches erect; lemmas glabrous or evenly scabrous; introduced species ..... 3. ***B. erectus***

E. Plants solitary or loosely tufted; leaves glabrous or pubescent, the blades flat, more than 3 mm wide; panicle open, the branches spreading; lemmas hairless or pubescent; native species

F. Lemmas hairless ..... 5. ***B. pubescens***

F. Lemmas pubescent

G. Lemmas pubescent only on the margins, hairless down the center of the back ..... 7. ***B. ciliatus***

G. Lemmas pubescent over the back

H. Leaf sheaths overlapping the nodes, conspicuously flanged and usually auricled at the collar; anthers 1.5–2.8 mm long ..... 4. ***B. latiglumis***

H. Upper nodes well-exserted; leaf sheaths not flanged at the collar

I. Lower glume 1-nerved; upper glume 3-nerved; glumes and lemmas shortly or stiffly pubescent; panicle more than 15 cm long; anthers 3.0–4.5 mm long .... 5. ***B. pubescens***

I. Lower glume 3-nerved; upper glume 5-nerved; glumes and lemmas silky pubescent; panicle less than 15 cm long; anthers 1.5–2.5 mm long .... 6. ***B. kalmii***

B. Annuals; flowering stems developing directly from the primary roots to which the remains of the grain can usually be found attached; introduced species

J. Lemmas narrow and tapering into the long (2–5 mm) terminal teeth sharply pointed at the callus; awns more than 10 mm long

K. Upper glume usually less than 10 mm long; pedicels capillary and flexuous; awns 12–17 mm long .... 14. ***B. tectorum***

K. Upper glume more than 10 mm long; pedicels sometimes flexuous but not capillary; awns about 25 mm long .... 15. ***B. sterilis***

J. Lemmas broad and rounded-out, the terminal teeth less than 1 mm long, blunt at the callus; awns up to 10 mm long

L. Panicle small, contracted and rather dense, the branches erect or ascending

M. Lemmas hairless, firm, smooth, their nerves obscure; anthers 1.5–2.5 mm long .... ***B. racemosus*** (p. 44)

M. Lemmas pubescent, soft, sunken between the prominent nerves; anthers 0.5–1.2 mm long .... 8. ***B. hordeaceus***

L. Panicle large (in well-developed plants), open, the branches spreading

N. Lemmas inflated, smooth and papery; awn rudimentary or very short; leaf sheaths and blades pubescent .... 9. ***B. brizaeformis***

N. Lemmas not inflated, hairless or pubescent; awn present (sometimes rudimentary or very short in *B. secalinus)*

O. Leaf sheaths hairless (blades usually hairy on upper side); awn, if well-developed, shorter than the lemma and kinked; brush of mature grain visible at top of lemma .... 10. ***B. secalinus***

O. Leaf sheaths pubescent; awn about as long as the lemma or longer, not kinked; grain brush included

P. Branches of the panicle rather stiffly spreading or drooping but not flexuous; awn straight; hairs on leaf sheaths reflexed, straight; anthers 1.5–2.0 mm long .... 11. ***B. commutatus***

P. Branches of the panicle slender, lax or flexuous; awn straight or curved; hairs on leaf sheaths spreading or reflexed, soft, and becoming matted on handling

Q. Palea distinctly shorter than the lemma; awn somewhat curved at maturity; spikelets rather turgid, generally green or straw-colored; lemmas firm; anthers 0.8–1.5 mm long .... 12. ***B. japonicus***

Q. Palea about equaling the lemma; awn straight on drying at maturity; spikelets less turgid, often pink or purple-tinged; lemmas thin; anthers about 3 mm long 13. ***B. arvensis***

1. *Bromus inermis* Leysser

Fig. 3, Plate 1, Map 1

awnless brome grass, Hungarian brome grass, smooth brome grass

Bromus inermis is one of our most valuable forage grasses. A native of southern Europe, it is introduced and now widely cultivated as a hay and pasture species especially in southern Ontario; it is usually seeded in mixture with alfalfa and other legumes. In the Prairie Provinces, its somewhat drought-resistant properties allow it better success than many other grasses. As an escape from cultivation or sporadically as a weed, it has become firmly established in practically all settled areas of Ontario northward to the Kenora District and the Clay Belt, where it grows luxuriantly on graded roadsides and field margins. The species was also grown at Attawapiskat on James Bay in 1957, and it is used extensively in new highway seedings· because of its rapid establishment and sod-binding qualities. Agronomic use of awnless brome grass is recent (compared with timothy and orchard grass), mainly within the last 2 or 3 decades. Its occurrence is therefore not recorded in Macoun's *Catalogue* of 1888 or in later plant lists for many areas of southern Ontario where the grass is well established today. As an adventive it was first collected at Toronto in 1903 in a dump, and 3 years later in open woods at Ottawa. Other early records are near grain elevators at Point Edward in 1911 and in rocky woodland at Guelph in 1929.

Great variation is exhibited in the fullness and color of the panicle, in the aspect of its branches, and in the stature and clone-forming habits of the plant. A conspicuous variant with bright yellow foliage is found occasionally, such as along the roadside south of Matheson, Cochrane District, in 1965. There is also variation in the pubescence and awning of the lemmas and Fernald (1933, 1936) has recognized two forms: f. *aristatus* (Schur) Fernald with short awns and f. *villosus* (Mert. & Koch) Fernald with short hairy lemmas. Most Ontario specimens possess one or the other or often both of these characteristics and consequently the variants do not seem to deserve naming.

2. *Bromus pumpellianus* Scribner

Plate 1, Map 2

Pumpell's brome grass

A species of the prairie borderlands of Western Canada but very restricted as an original inhabitant of Ontario, *Bromus pumpellianus* occurs

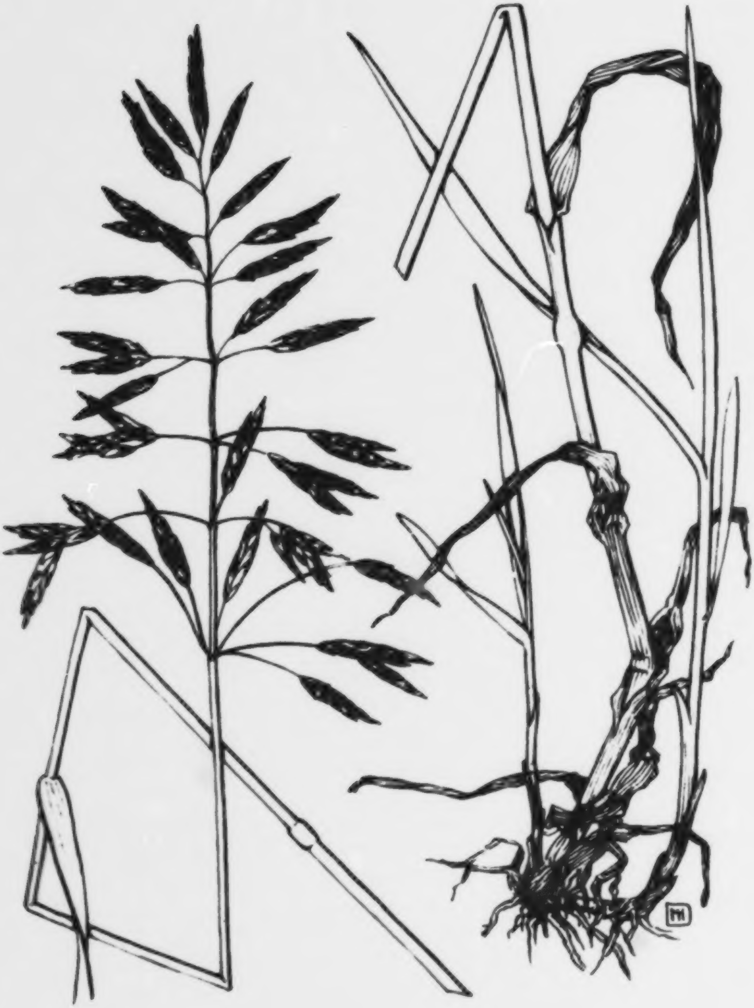
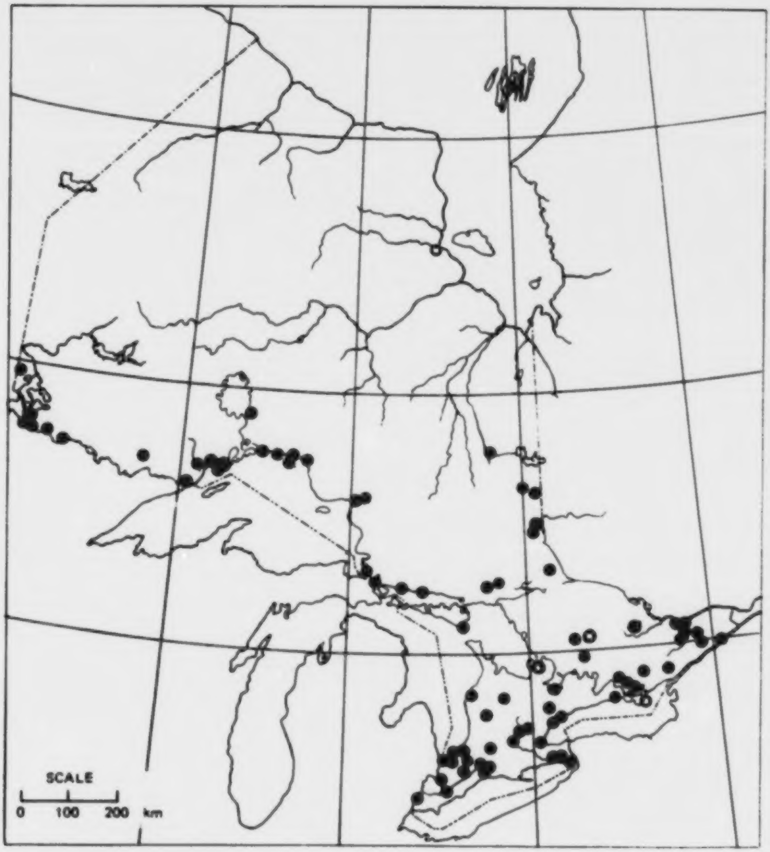


Fig. 3. *Bromus inermis* Leysser

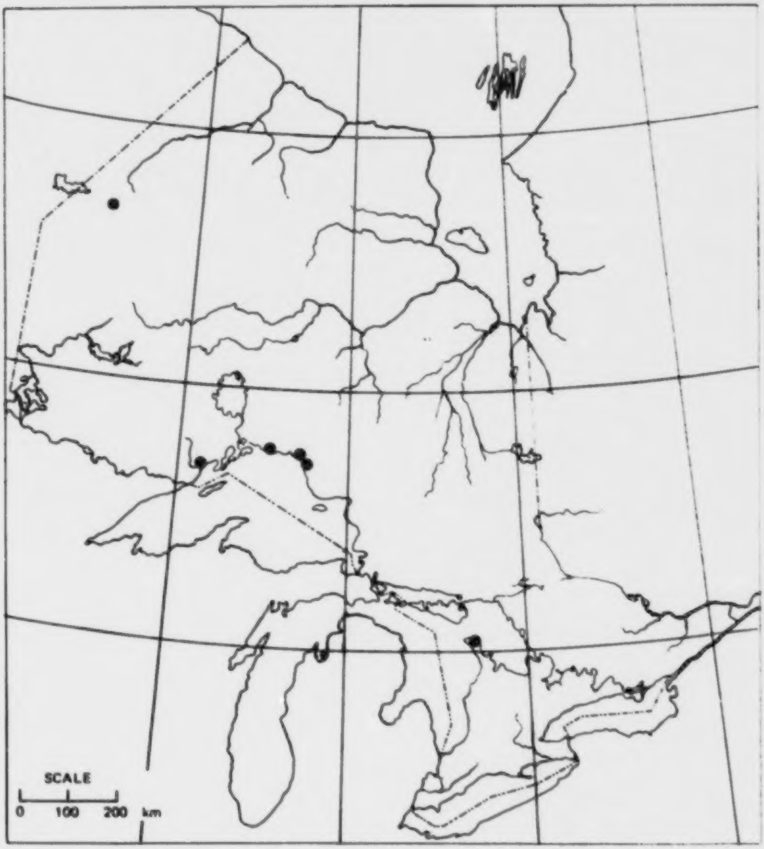


Map 1. *Bromus inermis.*

as a native only in the far northwestern portion of the province and perhaps also at the head of Lake Superior. A fragmentary specimen (but likely of this species) annotated "damp places, Severn River, July 7, 1886" was collected by J. M. Macoun. According to his diary, his expedition left Sandy Lake on July 8 for Hudson Bay so the site must be located on the Severn River near Sandy Lake.

The station shown near Thunder Bay on Wagnon's map (1952) was apparently placed there in error, because no specimen was then available from that area. In 1957 plants of this species were collected at approximately the same place, "sandy soil of a prairie relict area at Port Arthur," which is probably a natural occurrence. Specimens from the Bruce Peninsula, gathered on the sand dunes at Dunks Bay by Krotkov and reported by Krotkov (1940) as *B. dudleyi*, are considered to be adventive, like others collected in 1939 along the railroad at Port Coldwell and Heron Bay on the north shore of Lake Superior and at Sturgeon Bay, an old timber port on the Michigan shore of the lake.

The report from Wellington County (Stroud 1941) is based on plants cultivated at the Ontario Agricultural College. A plot mark in eastern Ontario shown by Elliott (1949), repeated by Wagnon (1952) and by Guire and Voss (1963) derives from a specimen sent to The New York Botanical Garden by James Fletcher in 1891. This particular specimen is also the basis of the illustration in Gleason's *Flora* (1952) and of the statement "introduced in . . . e. Ont." Fletcher's plant was experimentally cultivated at the Experimental Farm, Ottawa, from "seed from Banff, N.W.T." (Fletcher 1891, p. 180); the species does not occur naturally nor has it escaped in the Ottawa area.



Map 2. *Bromus pumpellianus.*

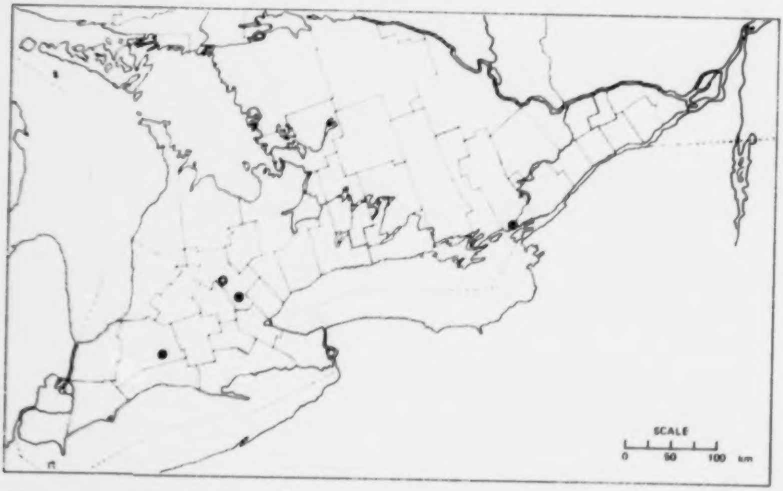
B. pumpellianus is related to *B. inermis* and both are sometimes included within a complex of rhizomatous types occurring from northeastern Asia to northwestern America. They both have $2n = 56$ and give hybrids with intermediate characters but with some degree of sterility, and Elliott (1949) considered them to be of subspecific rank. Wagnon subsequently made the combination *B. inermis* subsp. *pumpellianus* (Scribner) Wagnon. He referred the Ontario material to var. *purpurascens* (Hooker) Wagnon.

3. *Bromus erectus* Hudson

Map 3

upright brome grass

Although introduced early from the Old World, *Bromus erectus* is known from only four places in Ontario. Its occurrence was announced by J. M. Macoun in 1903: "roadside on south side of 2nd concession, London Township, Middlesex County, 1902, J. Dearness. New to Canada." The Dearness find, which he followed by others in the same area between 1902 and 1912, is antedated by others from London (Millman in 1881), and from Kingston (Fowler in 1883, 1885, and 1895; Millman in 1891); all these collections were originally referred to *B. ciliatus*. These old establishments have not been recently re-collected and are probably extinct. At Guelph *B. erectus* covers a large area in dry fields along limestone cliffs above the Speed River where it must have been sown several decades ago. This species grows vigorously under cultivation at Ottawa, but is not known to be used for forage purposes in Canada.



Map 3. *Bromus erectus*.

4. *Bromus latiglumis* (Shear) A. S. Hitchc.

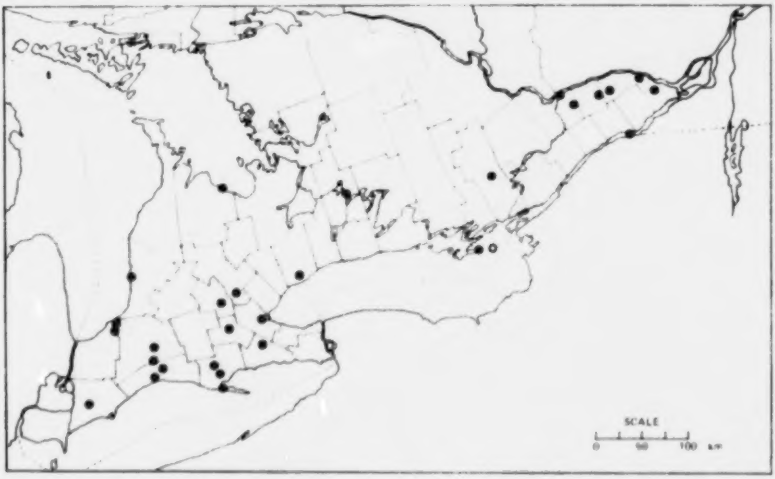
Plates 1 and 2, Map 4

flange-sheathed brome grass, tall brome grass

Possibly the largest of our wild brome grasses, growing 1–2 m high with numerous smooth broad leaves, *Bromus latiglumis* exhibits considerable potentiality as a forage grass. It is usually confined to rich alluvial soils along wooded stream banks and is rather rare in Ontario, being known only in some of the southern and eastern counties with outlying stations at Lambton Mills, Fenelon Falls, Meaford, and at Aylwin, Que.

A collection from dry open woods on granite near Sharbot Lake, lacking auricles and somewhat out of habitat and range, is tentatively referred to this species.

In his revision of this group of *Bromus*, Wagnon (1952) adopted the name *B. purgans* L. for this species. It has been shown (McNeill 1976, 1977) that this usage and Baum's (1967) application of *B. ciliatus* to this species are both based on erroneous typification.



Map 4. *Bromus latiglumis*.

5. *Bromus pubescens* Muhl. ex Willd. (*B. purgans* auct. amer. non L.)

Plate 2, Map 5

Canada brome grass

Bromus pubescens is a rare species of open woodlands. It grows 1–1.5 m high and has a large open panicle, sparse spikelets, long anthers, and a few widely spaced culm blades.

Considerable variation in pubescence is encountered. Plants with pubescent spikelets and foliage, typical of the species and the most prevalent form (f. *pubescens*), are known from Demorestville in Prince Edward County, Niagara Falls, Hamilton, Galt (now Cambridge), Spottiswood Lakes in Brant County, Tilsonburg, St. Thomas, Rondeau Park, and also on Marsh Island, Que., near Summerstown, Ont.

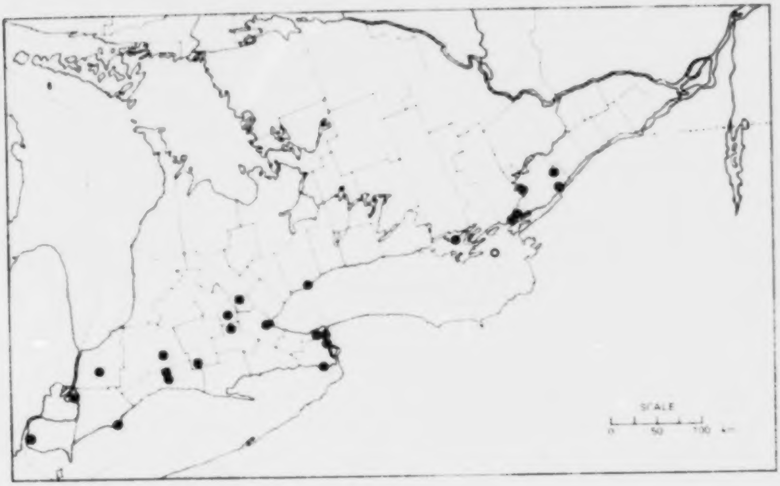
Plants with hairless lemmas but pubescent foliage were first collected at Galt (Cambridge) by Herriot in 1888 and initially described as *B. ciliatus* var. *laeviglumis* Scribner ex Shear (1900), later to be transferred to this species as *B. purgans* var. *laeviglumis* (Scribner ex Shear) Swallen (1941), but not considered worthy of transfer as a variety of *B. pubescens* by Wagnon in his revision (1952). In the rank of form, the correct name is *B. pubescens* f. *glabriflorus* (Wieg.) E. G. Voss. Besides the type locality of *laeviglumus*, "Galt" (actually "Patterson's woods," about 8 km to the south; *see* McNeill and Dore 1977), the form is known from London where it was collected by Dearness in 1910 and from Guelph by Dore in 1946, but not elsewhere in Ontario.

Plants with hairless foliage but pubescent spikelets are known from Chaffey's Locks in Leeds County, Spottiswood Lakes, Hamilton, Merritton in Lincoln County, Niagara, and Point Abino in Welland County; such plants can be named *B. pubescens* f. *laevivaginatus* (Wieg.) Seymour.

The accompanying map plots together the known records of all three forms but does not include two doubtful reports: one of "*B. pungens* L." (sic) from Port Franks, Lambton County, by Dodge (1915) and the other a specimen collected by Agassiz from "Lac Superieur."

Observations on Ontario specimens reveal that in *B. pubescens* the long anthers are extruded from the florets at anthesis (at least, they are not to be seen retained in mature specimens). This suggests that the species is an outcrosser, whereas the short anthers of *B. kalmii*, *B. ciliatus*, and *B. latiglumis* are retained during flowering, indicating selfing. This is in contrast to Wagnon's (1952) claim that the anthers are exserted in all four species.

Bromus nottowayanus Fernald—This species is reported from southern Ontario by Wagnon (1952) with mapped records from the Niagara Peninsula and at the eastern end of Lake Ontario (probably within New York State). This species is closely related to *B. pubescens* but has a 5-nerved upper glume and may be the result of hybridization of that species with *B. altissimus* or even *B. kalmii*. Its status is not clear and no specimens fully matching its description have been seen from Ontario. However, some specimens of *B. pubescens* collected by the senior author from limestone near Brockville and northeast of Kingston have the glumes 3- and 5-nerved.



Map 5. *Bromus pubescens.*

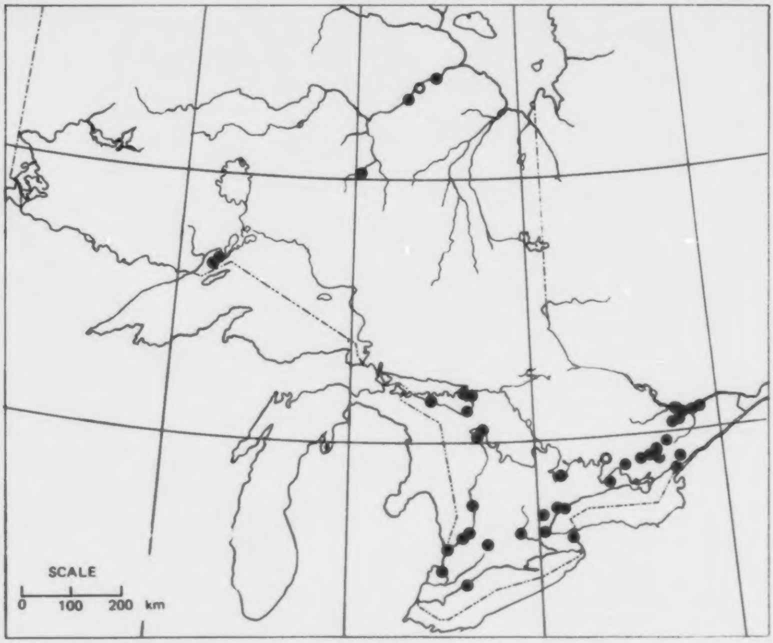
6. *Bromus kalmii* A. Gray

Plate 2, Map 6

Kalm's brome grass

A scarce native species, becoming rarer, *Bromus kalmii* remains abundant at a few spots where the terrain is undisturbed, for example on the limestone pavement at Great Cloche Island, Manitoulin District, in the alluvial prairie on Squirrel Island in Lake St. Clair, in dry woods on the old dunes at Port Franks, on the sands at Rondeau, on shallow, temporarily desiccated soil over granite in inner Frontenac County, and over limestone in Carleton County.

Essentially an open ground species, *B. kalmii* originally occupied those land sites early submitted to grazing by livestock; consequently it has declined in abundance or has completely succumbed in settled areas. Except for Hamilton in 1956, collections have not been repeated in recent decades at several old stations: Point Edward 1901; London 1882; Galt (Cambridge) 1902, 1903, and 1911; Hamilton 1900; Snelgrove 1893; Toronto 1890, 1891, 1902, and 1911; Marmora 1865; and Cartwright's Point near Kingston 1893. The species is still rather prevalent on Manitoulin Island, but on the Bruce Peninsula it is scarce and found only near the tip at Moore Lake and Dorcas Bay. Northern Ontario occurrences at Thunder Cape and The Sleeping Giant, although localized, may represent links in a migration chain extending to the shores of the Kenogami and Albany rivers.



Map 6. *Bromus kalmii.*

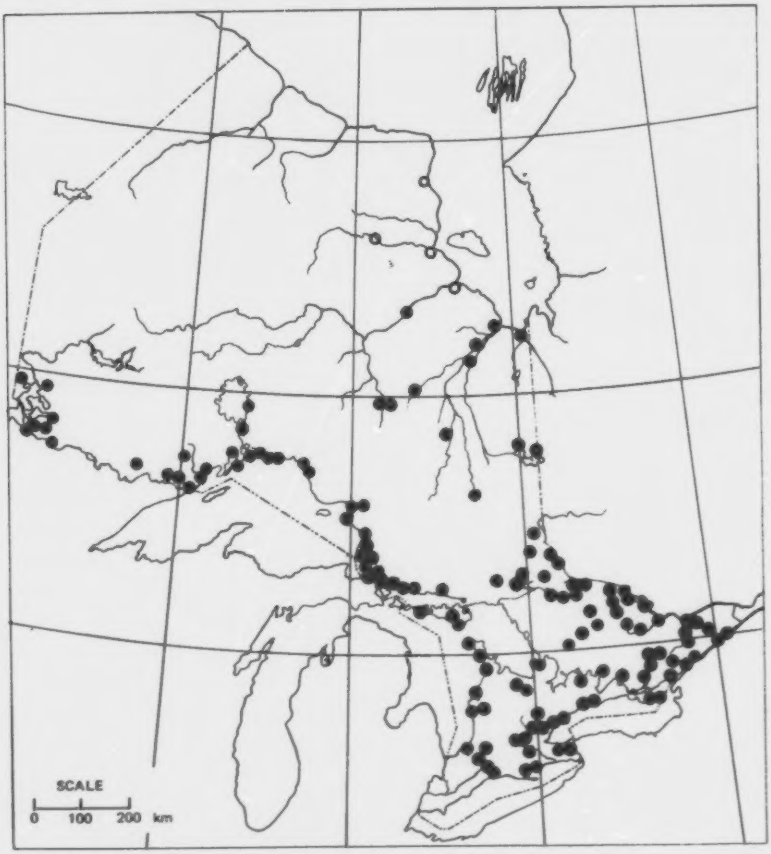
7. *Bromus ciliatus* L. (incl. *B. dudleyi* Fernald)

Plate 2, Map 7

fringed brome grass

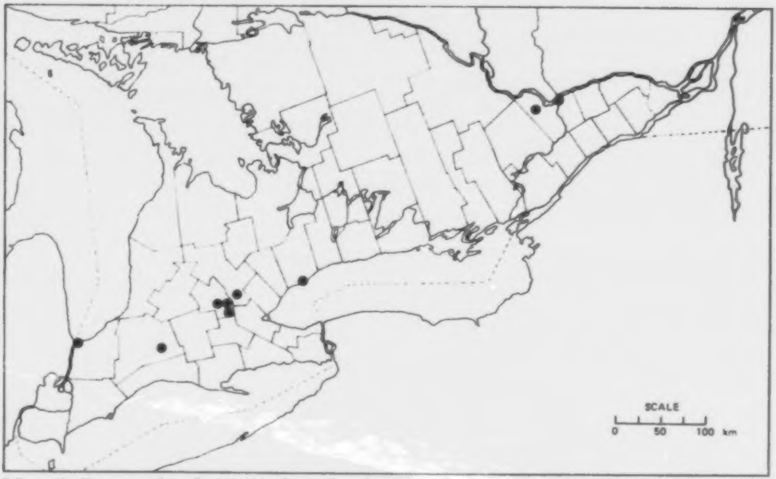
Bromus ciliatus is the most common of our native brome grasses, present throughout much of the province and especially abundant in the Algoma, Thunder Bay, and Kenora districts, where it is the most prevalent native grass next to *Calamagrostis canadensis*. Although mentioned by Dodge (1914, 1915) as "common in moist open woods and along shaded banks of streams" in Lambton County and "occasional at Point Pelee," no specimens have been seen from these well-botanized areas, nor have specimens come from other well-explored localities such as Rondeau, Long Point, and Hamilton in southern Ontario.

Bromus ciliatus shows great variation in stature, panicle type, and color of spikelets. Plants are usually about 1 m high with culms 2–3 mm thick; in southern Ontario coarse plants about 1.5 m high with culms 5–6 mm thick occur. Pubescence variants have been named. The typical form, f. *ciliatus* (var. *intonsus* Fernald; f. *intonsus* (Fernald) Seymour), comprises plants with distinctly pilose foliage, whereas those that are essentially hairless on sheaths and blades may be distinguished as f. *denudatus* Wieg. (var. *genuinus* sensu Fernald). The two forms occur with about equal frequency in Ontario and show no geographic segregation, although one variant may predominate exclusively at a particular site (McNeill and Dore 1977).



Map 7. *Bromus ciliatus.*

Bromus dudleyi Fernald has been separated from *B. ciliatus* on characters related to degree of maturity. The features of color of the spikelets (purple vs. green), aspect of glumes (flat vs. folded), and nature of palea veins (nonmarginal vs. marginal) tend to change as the panicle ripens. Other differences in panicle size and date of flowering given in the original description are probably a result of habitat conditions but even if genetically controlled are within the inherent range of individual variability of *B.*



Map 8. *Bromus hordeaceus* subsp. *hordeaceus*.

ciliatus. Specimens originally identified as *B. dudleyi* from the Bruce Peninsula (Krotkov 1940) have been revised either to *B. ciliatus* or *B. pumpellianus*.

Our reasons for retaining the established usage of the name *B. ciliatus* and rejecting the typification proposed by Baum (1967) are discussed in detail in McNeill (1976*b*).

8. *Bromus hordeaceus* L. (*B. mollis* L.)

Plate 3, Map 8

soft chess

Bromus hordeaceus is an abundant weed in British Columbia and Nova Scotia, but in Ontario, where conditions do not seem favorable for its persistence, collections are very few. The earliest are from London by Millman in 1882 and by Dearness in 1889 and 1894. Other early collections are from Toronto (about 1890), Galt (Cambridge) (1901), and Point Edward (1902). The species is reported by Dodge (1915) as being "frequent on roadsides and along railways" in Lambton County. More recent records are those from New Dundee in Waterloo County (1946), and at Stittsville (1956), and Ottawa (1957), in eastern Ontario.

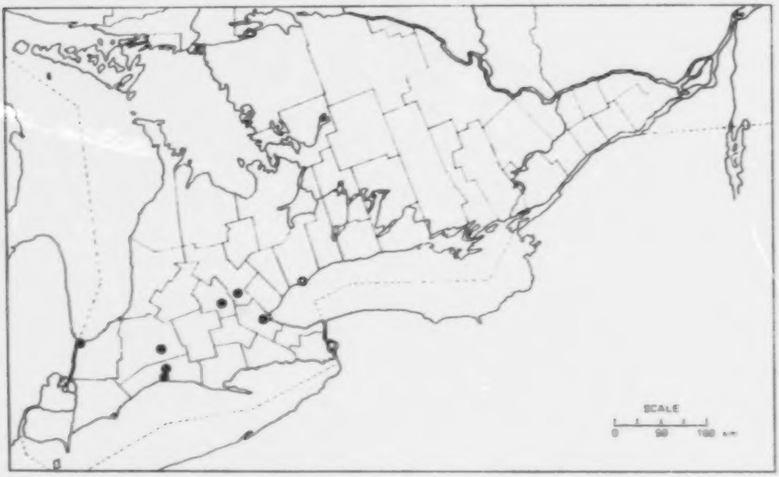
Current manuals treat this weedy *Bromus* as *B. mollis* L. but in former years *B. hordeaceus* was the name used. After a critical study of the Linnaean protologue, Smith (1965, 1968) has concluded that both names refer to this species. The earlier name, *B. hordeaceus*, must therefore be used. Following Smith's (1968) treatment of the group, the Ontario material would be referable to subsp. *hordeaceus*.

9. *Bromus brizaeformis* Fischer & C. A. Meyer

Plate 3, Map 9

quake grass, rattlesnake chess

A rather ornamental species, *Bromus brizaeformis* is easily recognized by its few, plump, pendant spikelets. It is often cultivated to provide dry bouquets that are then dyed. It has only been collected as an escape in Ontario in three localities: along streets in London by Dearness in 1889 and 1893, on a cemetery road at Sarnia by Macoun in 1901, and in cultivated soil near Port Stanley by James in 1952. All other known specimens are of garden-grown plants. Although reported by Dodge (1915) as "occasional in depot ground, freight yards and along railways" in Lambton County, this observation is difficult to accept because the plant does not persist and spread as a weed.



Map 9. *Bromus brizaeformis.*

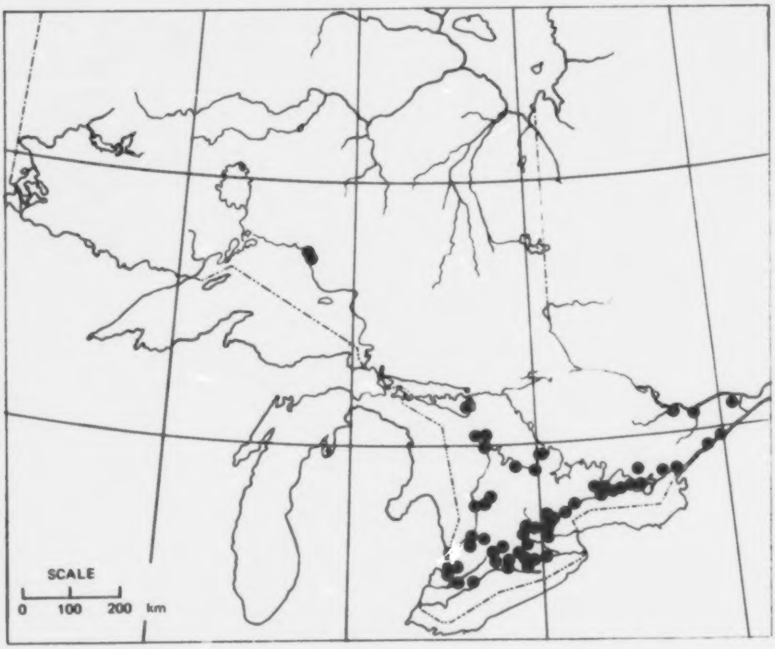
10. *Bromus secalinus* L.

Fig. 4, Plate 4, Map 10

cheat, chess

Formerly a serious weed in the wheat-growing areas of the southwestern counties, *Bromus secalinus* occurs elsewhere only temporarily along roadways and in waste ground. The species was introduced by the early settlers, probably repeatedly as an impurity in grain seed, because of its close similarity to wheat in size and shape. Numerous specimens were collected before the turn of the century: at Prescott 1860, Belleville 1878, Galetta 1879, London 1879, Cataraqui 1886, Brampton 1888, and Hamilton 1889. Since 1913 only one field infestation has been recorded in eastern Ontario, at Vankleek Hill in 1953. The species seems better adapted to the environmental conditions in southern Ontario, but even there, it is no longer regarded as a serious weed.

Almost all the occurrences in Ontario are of plants with glabrous spikelets (var. *secalinus*), but one specimen with pubescent spikelets (var. *hirtus* (F. W. Schultz) Hegi = var. *velutinus* auct. amer.) exists from Palermo, Regional Municipality of Halton, where it was collected in 1951. This is the first record of this variety in Canada.



Map 10. *Bromus secalinus*.

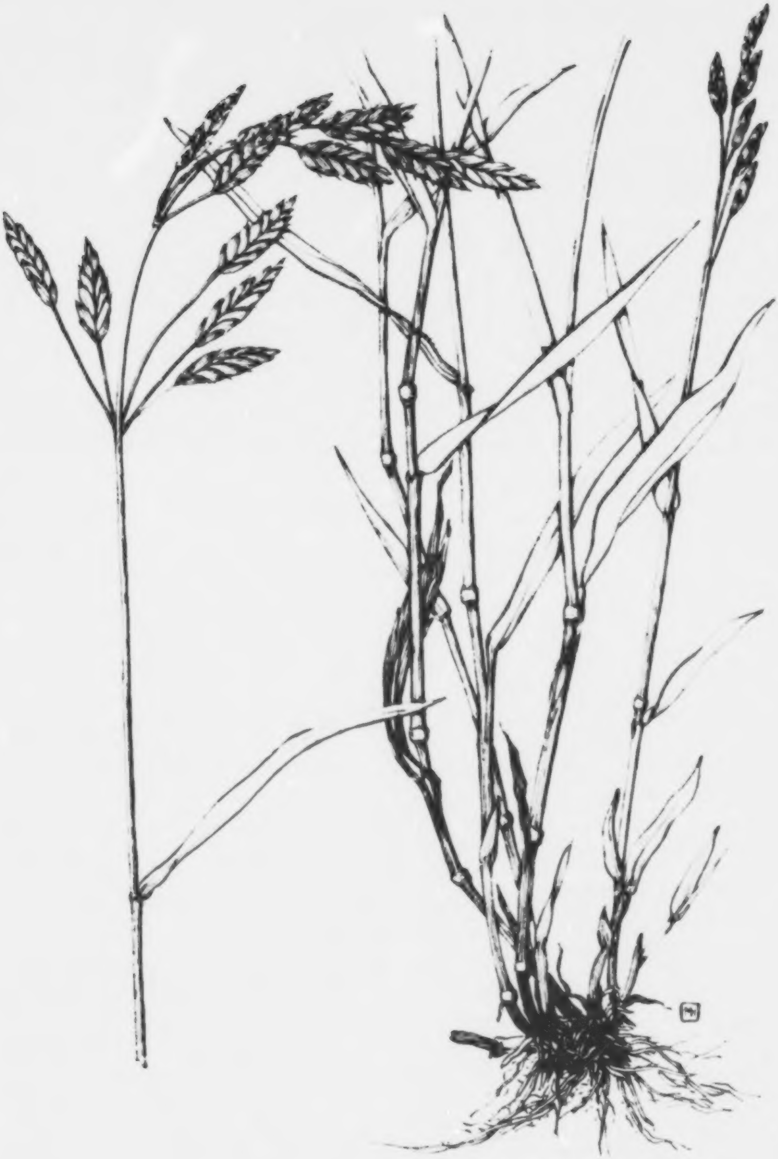


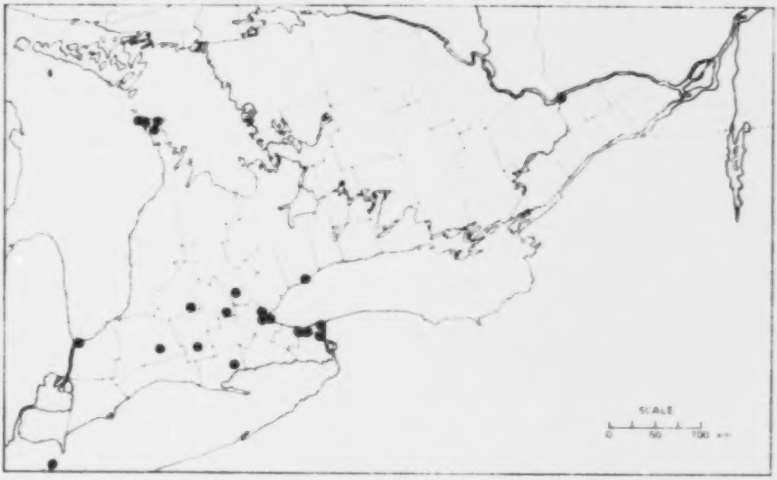
Fig. 4. *Bromus secalinus* L.

11. *Bromus commutatus* Schrader

Plate 4, Map 11

hairy chess

Although a weed of waste land and open ground, ***Bromus commutatus*** is not as widespread as *B. secalinus*, being restricted mainly to the area between Toronto, London, and Niagara, although it is known also from the tip of the Bruce Peninsula and Pelee Island. Early records are from Ottawa in 1900 (but not persisting), Woodstock 1901, Galt (Cambridge) 1902, Toronto 1903, and Guelph 1906; other records date after 1922 but only two since 1962. This species, unlike *B. japonicus*, does not seem destined to become a serious weed in Ontario. It shows a similarity to *B. hordeaceus* in its ecological requirements in that both species have become abundant in Nova Scotia and coastal British Columbia.



Map 11. *Bromus commutatus.*

Bromus racemosus L.—This species has been reported from the Bruce Peninsula, "found only once at Tobermory on sand beach" (Krotkov 1940), and from Toronto (Scott 1913), but both reports are based on depauperate specimens of *B. commutatus*. Other reports are published for Essex County, "road-sides and railway banks at Essex Centre" (Macoun 1888); Lambton County, "common on the islands," (Dodge 1914); Wellington County (Stroud 1941); and Waterloo County (Montgomery 1945); but no correctly identified specimens have been seen, and all appear to refer to *B. commutatus*.

12. *Bromus japonicus* Thunb. ex Murray

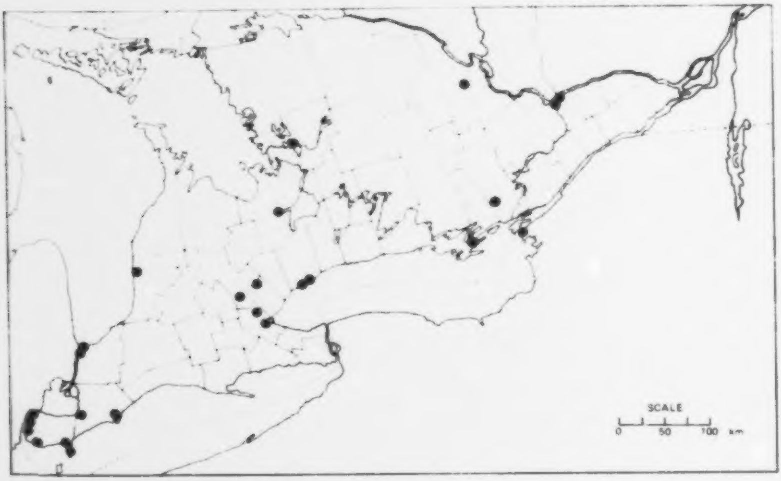
Plate 4, Map 12

Japanese brome, Japanese chess

A common and serious weed in the bordering states, *Bromus japonicus* has gained in importance only recently within Ontario. It is now widely established and abundant along roadsides and in refuse dumps in the southwestern counties, especially in western Essex County, and is threatening to spread throughout southern Ontario. Farmers at Storrington in Frontenac County and at Douglas in Renfrew County became aware of it as a "new weed" in 1962. The early records are scattered: Swansea 1912, Guelph 1926, Ottawa 1935, Downsview 1937, and Milford Bay, Muskoka District, 1942, but records increase rapidly after 1948. This species is now also abundant in the dry lands of southern Alberta and adjacent British Columbia.

Most plants in Ontario appear to belong to the poorly defined var. *porrectus* Hackel, which has rather straight awns (*see* Fernald 1941). When the spikelets are fully mature, however, the awns tend to twist divergently and thus simulate the typical variety.

Bromus danthoniae **Trin.**—A specimen referable to this polymorphic species native to southwest Asia was collected at the "ball grounds," Toronto, by W. Scott on July 5, 1904, and reported by Macoun (1906) as "*B. japonicus*, new to Canada." This is also the basis of Montgomery's (1956) and Boivin's (1967) references to an unnamed *Bromus* species from



Map 12. *Bromus japonicus.*

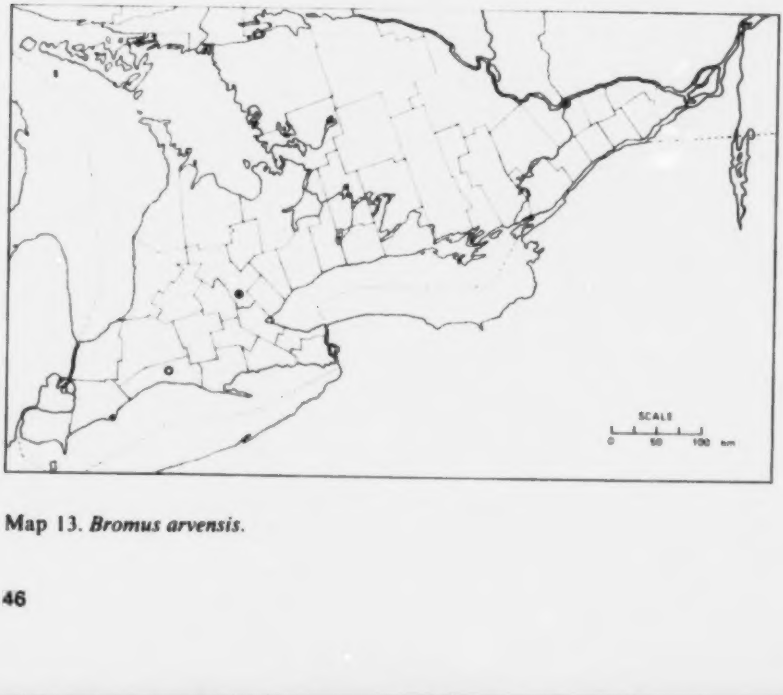
Ontario (*see* McNeill and Dore 1977). No subsequent collections have been made and the plant must have occurred as a temporary waif. The specimens are of a low annual grass like *B. japonicus* but differ from that species in their larger spikelets (2–3 cm long) on shorter stiff pedicels (0.5–1.5 cm long), and notably in the lemmas, at least of the upper florets, being 3-awned; these awns are divergently bent.

13. *Bromus arvensis* L.

Plate 5, Map 13

field chess

Bromus arvensis occurs as a weed in experimental plots at the Ontario Agricultural College, University of Guelph, where it has persisted since at least 1933. It is not known to be established elsewhere in the province. Plants in fertile soil grow to more than 1 m high and bear large panicles of more than 100 spikelets; plants growing in crowded masses, in contrast, become mature when only 25 cm high and have thread-like culms bearing as few as 2 spikelets. This versatile and early maturing annual would be difficult to control if it became widely established. Plants grown at the Experimental Farm, Ottawa, in 1923 did not persist, and an earlier report for St. Thomas (Fyles 1914, p. 493) is not substantiated by specimens. Elsewhere in Canada *B. arvensis* is known in British Columbia, where it also occurs as a weed.



Map 13. *Bromus arvensis*.

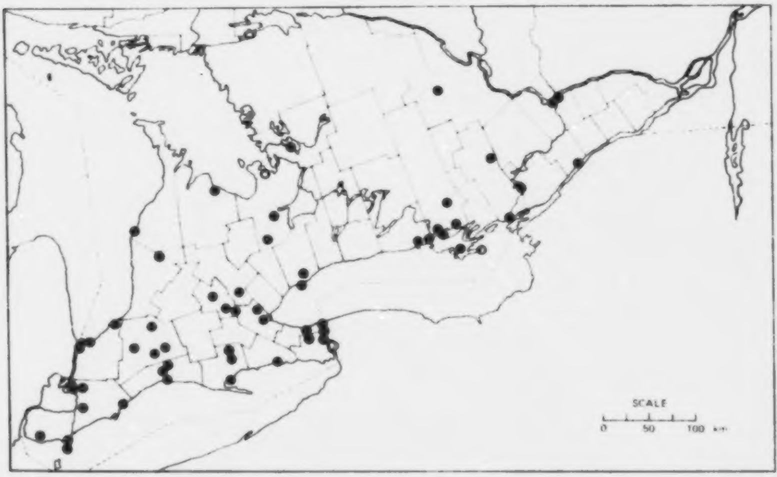
14. *Bromus tectorum* L.

Plate 5, Map 14

downy brome, downy chess

Bromus tectorum has long been a common and troublesome weed in the southwestern counties. It has spread into the eastern counties much more recently with infestations starting along railroads at Smiths Falls in 1943, Shannonville 1947, Chaffey's Locks 1947, Ottawa 1950, Cherry Valley in Prince Edward County 1956, Prescott 1960, Eganville 1964, and Snow Road, in Frontenac County 1964. It had also extended northward to Meaford in 1942 and Bala in 1955 but is not yet known in northern and northwestern Ontario. In the dry areas of Alberta and British Columbia, *B. tectorum* is one of the worst rangeland pests and is a fire hazard. Possibly the earliest Canadian record (according to Groh 1946) is from Kingston in 1886, where it was not again collected until 1952, undoubtedly from a fresh source. Other early specimens from Ontario were located at Niagara Falls in 1891, Sarnia 1896, Galt (Cambridge) 1907, and Hilton in Algoma District 1913.

In 1915, Dodge particularly noted its persistence at Wees Beach, Sarnia, where he had collected it as early as 1896. It is not included, however, in his list for Point Pelee made in 1914, and the first specimen was not recorded there until 1939. Today the weed has so overrun the sands in Point Pelee Park that it creates a nuisance for those visiting the beaches for recreation.



Map 14. *Bromus tectorum.*

The plant matures very early (behaving as a winter annual) and sheds its somewhat prickly grains in a group in the latter part of June. The awns of the spikelets work into woollen clothing allowing the sharp callus to scratch the flesh.

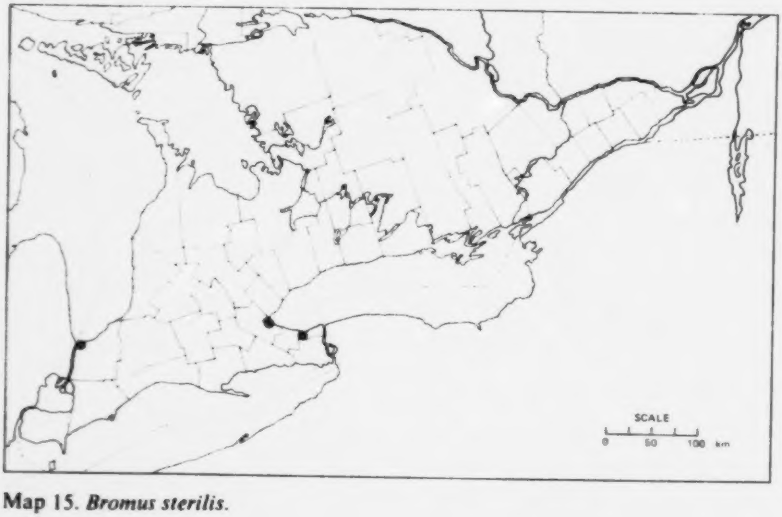
The spikelets are usually finely hirsute (var. *tectorum*) but a variant with hairless spikelets (var. *glabratus* Spenner), which is present in the western provinces and common in Europe, has been detected among specimens collected at Point Pelee in 1953. The color of the panicle when immature may vary from green to red (f. *coloratus* Jansen & Wachter), but plants of each color are usually intermixed at a site. When they ripen, all panicles turn pale brown, but their pericarps become either brown or purple. Stature varies greatly with growth conditions; on dry warm ground single-stemmed plants attain a height of 30–60 cm with ample panicles and produce many tillers from the base.

15. *Bromus sterilis* L.

Map 15

barren chess

The earliest known collection of *Bromus sterilis* was made "near Sarnia" by T. C. Wheately in 1896 and was reported by Dodge (1914), but it has not been found in the area subsequently (Gaiser and Moore 1966). It was collected at Burlington in 1902 and west of Jordan in the Niagara Peninsula in 1952. Apparently it is a sporadic introduction, not persisting.



Map 15. *Bromus sterilis*.

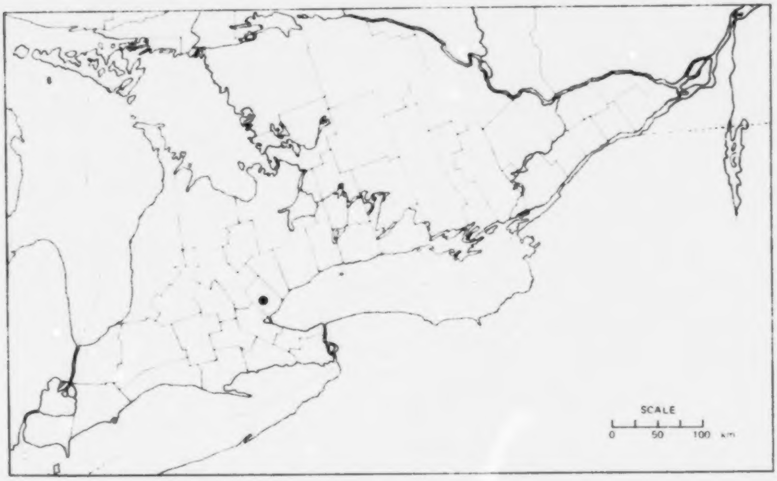
16. *Bromus carinatus* Hooker & Arnott

Plate 5, Map 16

California brome grass

A western native grass, *Bromus carinatus* was detected first in 1944 at Milton, Regional Municipality of Halton, as a single plant along the railroad. In 1948 no plants could be detected at the exact site, but in weedy backyards off the main street it was found in abundance.

The grass appears to be an annual, freely seeding itself. On the Pacific coast where it is abundant, it is relished by all classes of livestock. If given suitable attention, it could prove valuable as a forage grass in the climate of southern Ontario.



Map 16. *Bromus carinatus.*

Bromus catharticus Vahl—This tall grass, in the same group (*Ceratochloa*) as *B. carinatus*, is sometimes cultivated as an ornamental plant but is not known as an escape.

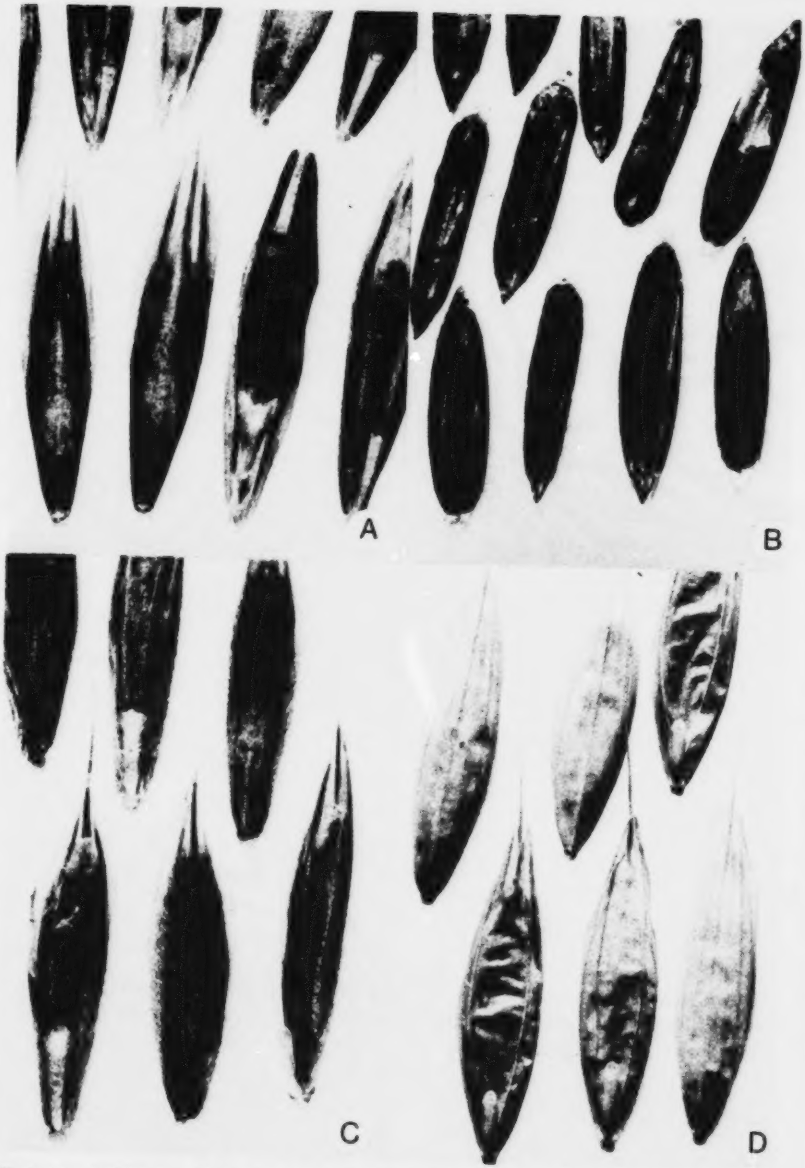


Plate 1. *A*, Florets of *Bromus inermis* (Dore 24262); *B*, Caryopses of *B. inermis* (Dore 24262); *C*, Florets of *B. pumpellianus* (Dore 20453); *D*, Florets of *B. latiglumis* (Dore 17340).

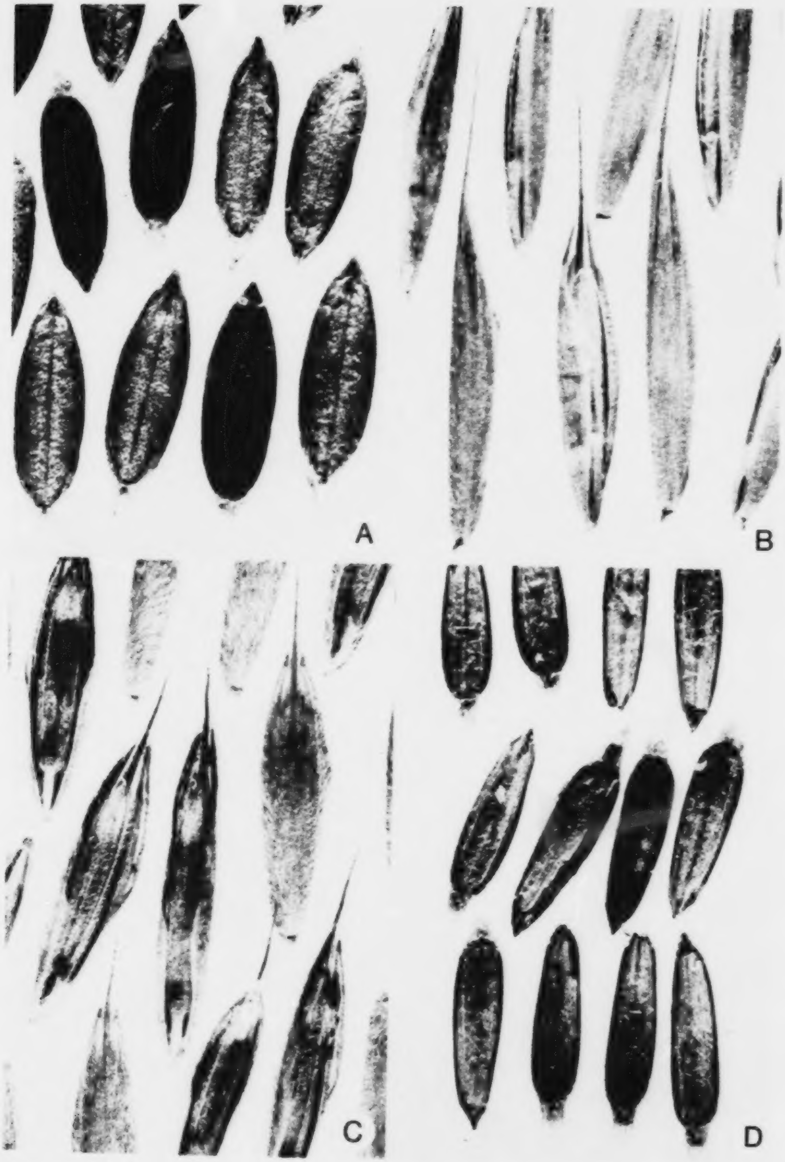


Plate 2. *A*, Caryopses of *Bromus latiglumis* (Dore 17340); *B*, Florets of *B. pubescens* (Dore and Gogo 21451); *C*, Florets of *B. kalmii* (Soper and Shields 5038); *D*, Caryopses of *B. kalmii* (Soper and Shields 5038).

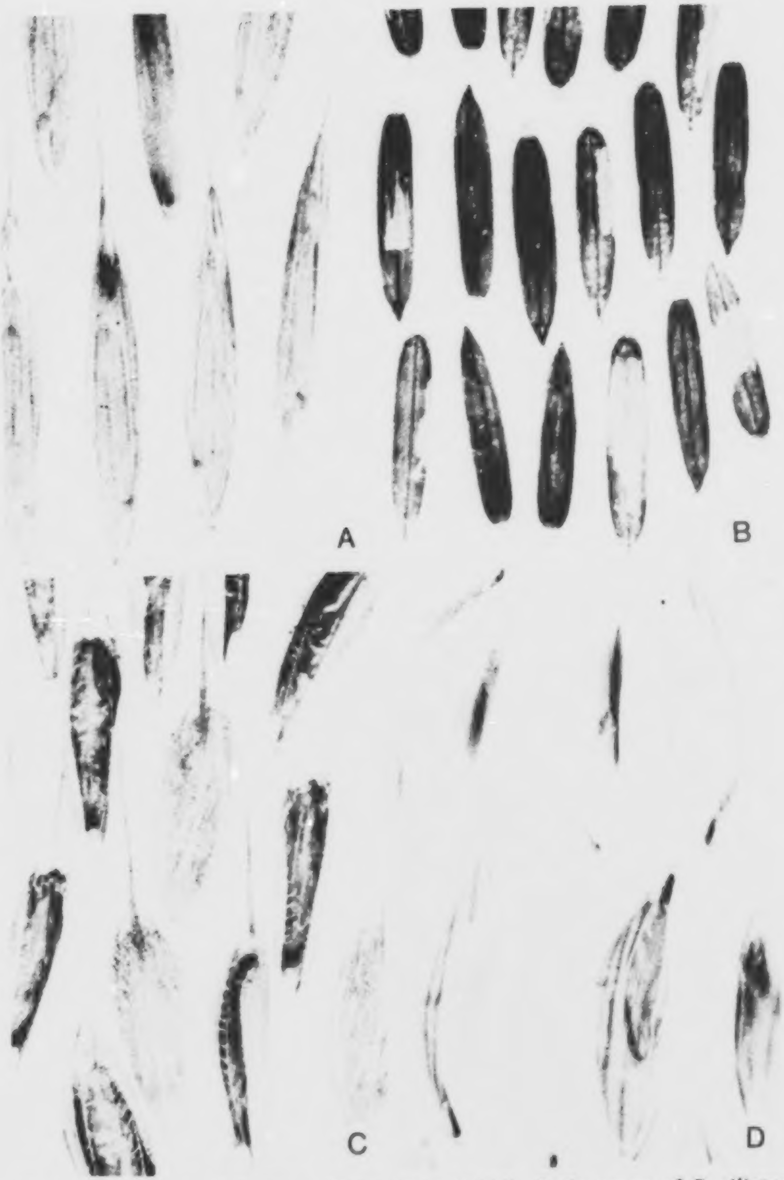


Plate 3. *A*, Florets of *Bromus ciliatus* (Dore 18335); *B*, Caryopses of *B. ciliatus* (Dore 18335); *C*, Florets of *B. hordeaceus* (Calder 10145B); *D*, Florets of *B. brizaeformis* (James 1601).

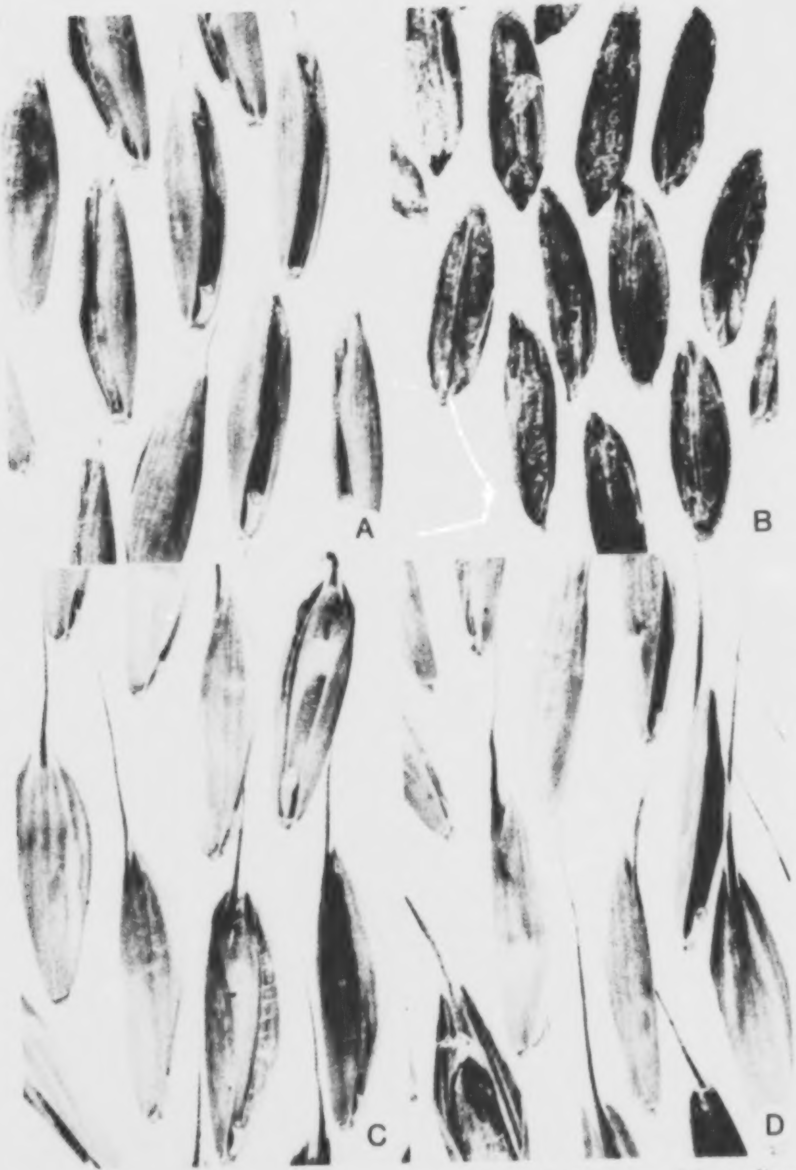


Plate 4. *A*, Florets of *Bromus secalinus* (Gaiser 2626); *B*, Caryopses of *B. secalinus* (Frankton 759); *C*, Florets of *B. commutatus* (Dore 22053); *D*, Florets of *B. japonicus* (Dore 24059).

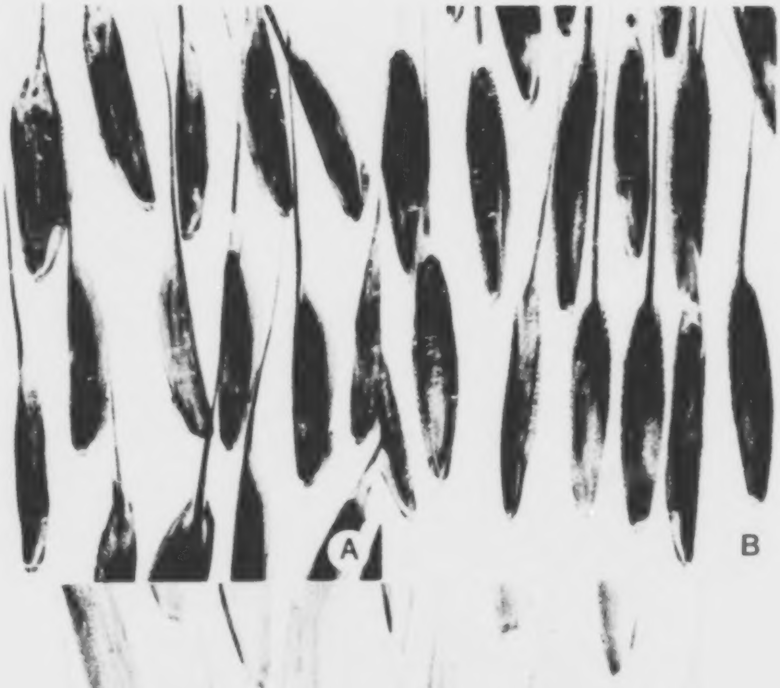


Plate 5. *A*, Florets of *Bromus arvensis* (Dore 46-102); *B*, Florets of *B. tectorum* (Dore 21371); *C*, Florets of *B. carinatus* (Dore 8704).

2. Festuca L.

Perennials, mostly tufted although sometimes rhizomatous (*F. rubra, scabrella*). Leaf blades broad and flat, or narrow, permanently folded and wire-like. Ligule membranous, usually very short and minutely ciliate. Spikelets more than 2-flowered, borne in panicles that may be loose and spreading (*F. obtusa, occidentalis*) or stiff and spike-like (*F. ovina, rubra, saximontana*, etc.). Glumes acute, unequal in length and rounded on the back. Lemmas rounded on the back at least below, soft and herbaceous (*F. pratensis, occidentalis*) or firm and hard (*F. obtusa, tenuifolia*), sometimes pointed and awned from the tip (*F. longifolia, rubra*, etc.), sometimes awnless (*F. obtusa, tenuifolia*) and membranous tipped (*F. pratensis*) but never awned from between two terminal teeth as in *Bromus*. Lemmas usually smooth or scabrous toward the tip, but occasionally hairy (forms of *F. rubra* and *F. longifolia*); such hairs not confined to the nerves and never in a webby mass from the callus as in *Poa*; lemma nerves 5, converging to the tip, never prominently raised as in *Glyceria*.

A. Leaf blades generally more than 3 mm wide, soft, flat, convolute in the shoot and inrolling on drying; lemmas awnless
  B. Spikelets 3- to 5-flowered, borne toward the tips of long-spreading branches in a sparse panicle; lemmas about 4 mm long, smooth and nerveless on the back, firm and coriaceous to the apex; a native woodland species .... 3. ***F. obtusa***
  B. Spikelets 4- to 10-flowered, borne uniformly throughout the panicle; lemmas 5–7 mm long, distinctly nerved on the back, with thin membranous upper margins; adventive species of roadsides, meadows, and pastures
    C. Spikelets 6- to 12-flowered in a slender panicle closed after flowering, with one of the branches at each node usually bearing but a single spikelet; leaf blade collar without cilia; basal leaf blades 3–6 mm wide .... 1. ***F. pratensis***
    C. Spikelets usually 4- to 8-flowered in a large panicle open after flowering, the shorter of the two branches at each node with a few to several spikelets; leaf blade collar broadly flanged and bearing cilia; basal leaf blades 4–12 mm wide .... 2. ***F. arundinacea***
A. Leaf blades less than 3 mm wide, usually permanently folded, conduplicate in the shoot; lemmas awned or awnless
  D. Glumes as long or almost as long as spikelet, membranous; lemmas uniformly scabrous; anthers 4–5 mm long; leaf blades minutely and densely papillose-scabrous below; plant tufts deeply set in soil and originating from rhizomes; localized in Thunder Bay District .... 12. ***F. scabrella***

D. Glumes distinctly shorter than spikelet; lemmas scabrous only near tip, smooth below or sometimes hirsute; anthers 0.7–3 mm long; leaf blades smooth or scabrous

E. Leaf sheaths (when fresh) closed to near top, red-brown or dark brown, usually retrorse-hirsute, on drying becoming fibrillose due to splitting of membranous tissue between the veins; plants rhizomatous; leaf blades, especially those of the culm, sometimes expanding .... 11. ***F. rubra***

E. Leaf sheaths open to base or almost to base, the dead sheaths usually whitish or drab colored, not splitting into coarse fibres; plants tufted; leaf blades always closely folded

F. Lemmas 2.5–3.5 mm long, awnless or with an awn point less than 0.3 mm long, firm, smooth, usually brownish; leaf blades hair-like, 0.2–0.3 mm diam, gradually tapering, rough, flexuous; anthers 1.5–1.8 mm long; introduced .... 4. ***F. tenuifolia***

F. Lemmas more than 3 mm long with awns more than 0.5 mm long; leaf blades usually thicker, 0.3–1.3 mm diam

G. Awns 2–7 mm long, often longer than lemma body; lemmas 5–6 mm long, membranous; panicle 10–25 cm long, with a few, slender, spreading or reflexed branches; caryopsis hairy at top; native, upper Great Lakes .... 10. ***F. occidentalis***

G. Awns up to 3.5 mm long, shorter than lemma body; lemmas 3–5 mm long, usually coriaceous; panicle usually less than 10 cm long, with short erect branches becoming spike-like after flowering; caryopsis hairless at top

H. Leaf blades 0.5–1.2 mm diam; lemmas of lower florets 3.8–5 mm long; anthers 2.7–3 mm long; introduced, common .... 9. ***F. longifolia***

H. Leaf blades 0.3–0.5 mm diam; lemmas 3–4.5 mm long; anthers 0.5–2.5 mm long

I. Culms usually 5–20 cm high; panicle usually less than 3 cm long; anthers 0.5–0.9 mm long; native, arctic species

J. Culms smooth; panicle narrow, ± cylindrical .... 5. ***F. brachyphylla***

J. Culms puberulent; panicle somewhat narrowly ovoid .... 6. ***F. baffinensis***

I. Culms usually 30–50 cm high; panicles usually 5–10 cm long; anthers 1.2–2.5 mm long

K. Anthers 1–1.5 mm long; lemmas of the lower florets 3.5–4 mm long; native, upper Great Lakes .... 7. ***F. saximontana***

K. Anthers 2–2.5 mm long; lemmas 3–3.5 mm; introduced, rare .... 8. ***F. ovina***

1. *Festuca pratensis* Hudson (*F. elatior* L. pro parte)

Fig. 5, Plate 6, Map 17

meadow fescue

Festuca pratensis is a useful pasture and meadow species found throughout the settled portion of the province, but only abundantly in the south-central counties centering on Peel and Halton where it is completely naturalized on the heavy soils; elsewhere plants occur sporadically along roadsides, beaches, and in waste places. The species was deliberately introduced to Canadian agriculture from Europe in the early days, but occurrences in northern Ontario are more recent. No specimens have been gathered in the Sault Ste. Marie and Lakehead areas, but the plant likely occurs there also.

In addition to the characters given in the key, this species can be distinguished from *F. arundinacea*, which it resembles, by its more slender culms, its softer evanescent basal leaf sheaths, and its shorter thinner leaf blades less prominently veined below.

Numerous strains have been selected for forage and turf purposes. The species is diploid and a chromosome count of $2n = 14$ has been reported in Ontario material from Napanee by Bowden (1960*a*). The name *F. elatior* L. has long been used in America for meadow fescue but because of ambiguity in its correct application between this and the following species, it has been rejected in recent European treatments (*see* Hylander 1953, Terrell 1967).

2. *Festuca arundinacea* Schreber (*F. elatior* var. *arundinacea* (Schreber) Wimmer)

Plate 6, Map 18

tall fescue

Festuca arundinacea has been considered a variety of meadow fescue or sometimes confused with vigorous plants of that species, but the firmly rooted tussock-like clumps of broad, dark green, and glossy-backed leaves with smooth, leathery, and slowly decaying sheaths distinguish it strikingly in the field. The panicle branches spread widely and do not close up after flowering in contrast to the slender arching panicles of *F. pratensis*. The ciliate auricle, although a minute character, is also diagnostic (Crowder 1953). This species is hexaploid, $2n = 42$. It is of little value as a fodder plant and too coarse for lawn purposes.

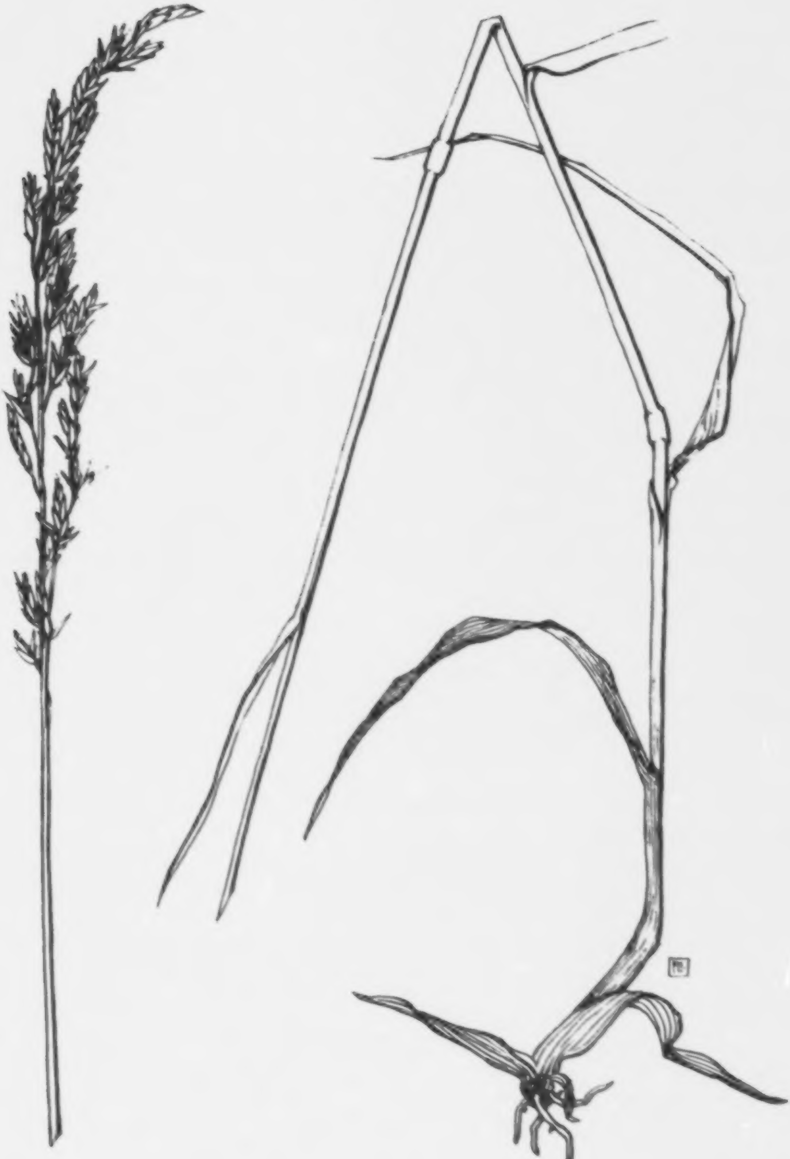
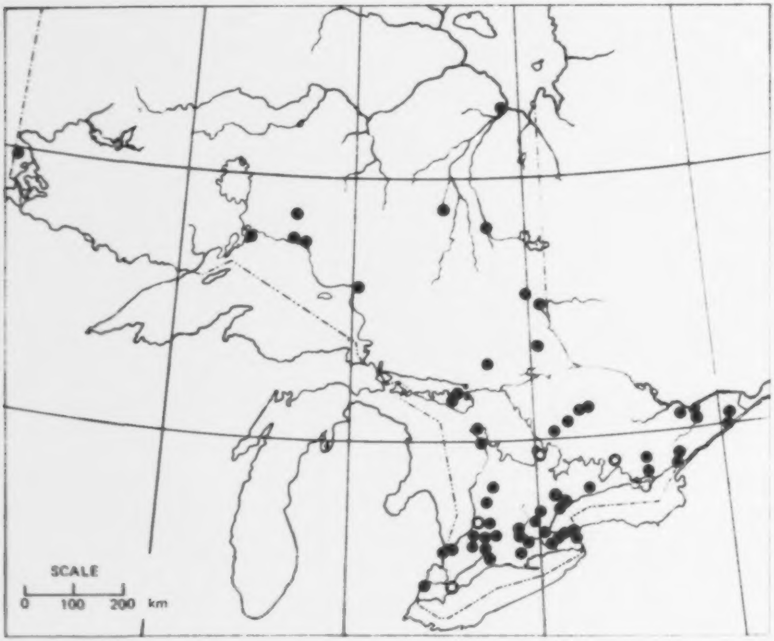


Fig. 5. *Festuca pratensis* Hudson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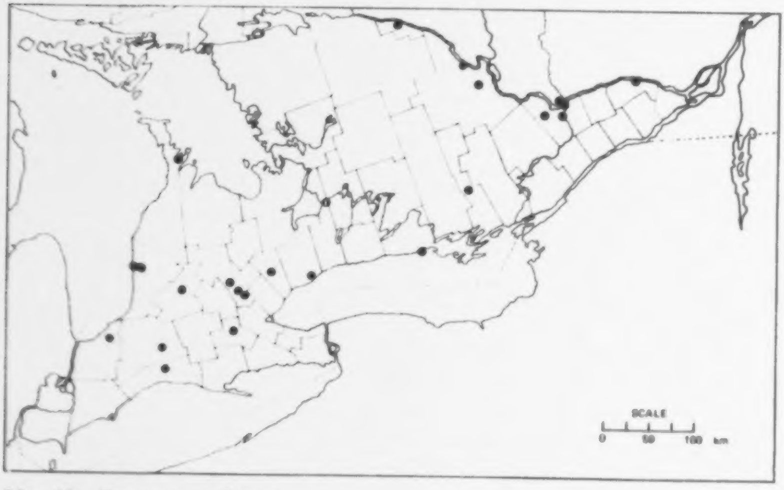
Map 17. *Festuca pratensis.*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Map 18. *Festuca arundinacea.*

The grass established itself firmly at Guelph sometime before 1923 on the roadsides near the Agricultural College. Isolated plants had been gathered earlier, however, at other points in Ontario: London by Burgess in 1878 and Millman in 1879, Brampton 1890, and Arkell, Wellington County, 1904. Spontaneous establishments have subsequently been noted in rather widely dispersed localities, usually in ditches or wet soil.

About 1950, tall fescue started to become popular for turf and meadow seedings and has been found economic for use in coarse highway mixtures, where it establishes well. Consequently, extensive and dense stands may now be seen lining public roadways, wherever new grades or embankments have been constructed and seeded.

There is also evidence that this vigorous grass is spreading to adjacent terrain and, in time, is sure to become a common and widespread element of our flora. Where not wanted it becomes a persistent weed difficult to eradicate because of its strongly rooted and short, tough rhizomes. Along the Maitland River in Huron County, for example, it is quickly taking over the wild meadows of the flood shores to the exclusion of the rare native species localized there. Most home owners dislike its rapid and clumpy appearance in their lawns, usually resulting from an injudicious selection of a cheap seed mixture. Several commercial strains of tall fescue are now available, cv. Alta being one of the most widely grown.

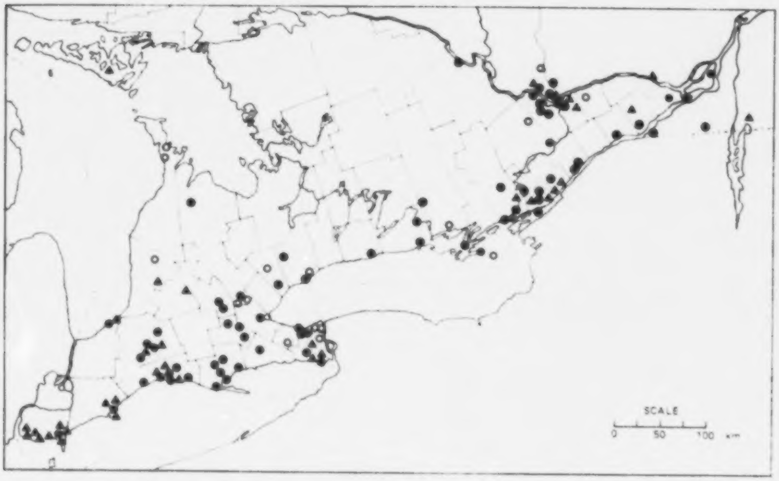
3. *Festuca obtusa* Biehler

Plate 6, Map 19

nodding fescue

Festuca obtusa is a characteristic species of rich deciduous woods, where it is often abundant; it is readily distinguished from the few other grass species that grow there by its large clumps of broad leaves overtopped by sprawling culms with long panicle branches. The loose spikelets flower early and reach maturity about the end of June when the ripe florets shatter readily, making the plants rather difficult to identify. As a result, specimens in herbaria have often been confused with *Poa saltuensis* and *P. languida*. The lemmas of *F. obtusa*, however, lack all trace of tangled hairs at their base; the glumes are scabrous on the keel and upper part of their margins, and its panicle branches are sharply 3-angled with scabrous wings. The common name, an appropriate one, derives from *F. nutans* auct., a name by which the species was once known.

The distribution of *F. obtusa* is not uniform across southern Ontario and apparently certain large sections are lacking it. Its absence from some of these areas does not appear to be a result of unsuitable conditions, and it may be that it has spread with man and has not yet colonized all possible



Map 19. *Festuca obtusa* f. *obtusa* (•) and f. *pilosifolia* (▲). All known Canadian records from the area covered by the map are plotted.

habitats. This is supported by the rather plump fruits that are easily stripped off by hand when ripe. This feature as well as the disposition of some isolated stands, suggests utilization as a grain by native peoples or pioneers. There are concentrations around Ottawa and in Leeds County but an intervening area of about 60 km requires more search. The absence northward from the center of Lake Ontario is to be expected, although west of Toronto the plant is abundant on the shallow soils of the Niagara Escarpment. It is sparse elsewhere and according to the collectors, many of the known specimens represent single, rare tufts. In these areas the grass could easily be eliminated were the woodland to be grazed.

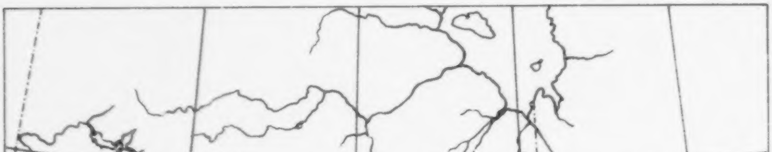
Two distinctive pubescence forms are represented in Ontario. These have the same chromosome number, $2n = 42$ (Bowden 1960*a*), and are sometimes, but not often, mixed together at the same site (McNeill and Dore 1977). One form, f. *obtusa*, lacks hairs on its foliage, is more frequent, and has about twice as many existing records as that of the other form, f. *pilosifolia* Dore. The latter has pilosity on its leaf sheaths and blades that is visible when examined against the light. It occurs almost exclusively in Essex County and southern Leeds County, but it is not represented among specimens from Prince Edward County to Norfolk County. It is to this pilose variant that the isolated collections from Mindemoya (Manitoulin Island), Gros Cap (mouth of St. Mary River at Lake Superior), and Lake of the Woods Provincial Park (the latter two sites are farther west than the area covered by the map) refer. Another isolated collection, this time of glabrous plants, is from sandy woods near an archeological site on Morrison Island in the Ottawa River. The species is not known elsewhere in the extensive well-collected terrain around it.

4. *Festuca tenuifolia* Sibth. (*F. capillata* Lam.; *F. ovina* var. *capillata* (Lam.) Alef.)

Plate 6, Map 20

hair fescue

Festuca tenuifolia is a slender, wiry-leaved grass with rough, flexuous, thread-like blades tapering gradually to the tip. It is a troublesome weed, especially in the Maritime Provinces where it has taken over extensive areas on sandy soil. In Ontario, examples of infestations occur in an old field on shallow sandstone at Bells Corners near Ottawa, and at Whitney on a sandy railroad embankment. The grass is abundant on Cedar Island at the east end of Lake Ontario near Kingston, where its occurrence probably relates to an early lawn planting. In a survey of the St. Lawrence Islands National Park it was found on three of seven islands visited but it occurred only sparsely and was always located adjacent to picnic pavilions. The small spikelets shatter easily at maturity like *Vulpia octoflora* and presumably are carried readily from place to place by people and equipment.



Map 20. *Festuca tenuifolia*.

The occurrence of hair fescue in old established lawns is suspected of being widespread, but it is difficult to assess because of the lack of specimens and apparent repression of flowering with sod-binding. Large expanding mats of this species, rather than loose tufts, often constitute the only turf in the moist shaded portions on the north side of buildings or under trees and their presence in such areas is of decided value. On dissection of these mats, slender underground structures resembling rhizomes are to be found. However, they lack the scale leaves characteristic of true rhizomes and may be interpreted as old vegetative culms from which the leaves have decayed. Chromosome counts from such nonflowering mats indicate $2n = 14$, which is the same number as generally reported for *F. tenuifolia* (McNeill and Dore 1977).

This species has generally been known in North America as *F. capillata* Lam. However, as Voss (1972*a*) points out, this name is illegitimate and *F. tenuifolia* Sibth. is the next available name. It is sometimes reduced to infraspecific rank under *F. ovina*, as var. *tenuifolia* (Sibth.) Dumort. (var. *capillata* (Lam.) Alef.) or as subsp. *tenuifolia* (Sibth.) Arcangeli.

5. *Festuca brachyphylla* Schultes (*F. ovina* var. *brachyphylla* (Schultes) Piper)

Plate 7, Map 21

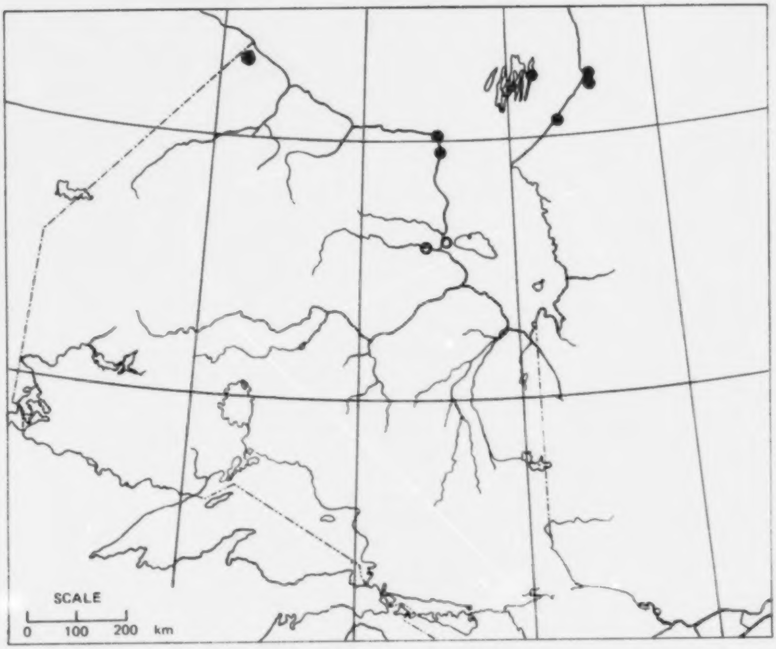
Festuca brachyphylla is a characteristic species of arctic and alpine regions and is abundant in all far northern parts of Canada. It occurs in Ontario only along Hudson Bay and the upper part of James Bay.

6. *Festuca baffinensis* Polunin

Map 22

Festuca baffinensis was described in 1940 by N. Polunin and is widespread in central arctic North America and possibly also in the USSR. It is known in Ontario only from a Cape Henrietta Maria collection made in 1953 by Dutilly and Lepage. This was reported by Dutilly et al. (1954) as an unusual southward extension of range.

The species differs from *F. brachyphylla* not only in its hirsute culms and somewhat broader, darker-colored panicle but also in apparently being tetraploid ($2n = 28$), whereas *F. brachyphylla* has usually been reported as hexaploid ($2n = 42$). Tolmachev (1964) has treated the two as conspecific and the problem of their status and our reasons for maintaining them are discussed by McNeill and Dore (1977).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Map 21. *Festuca brachyphylla.* All known records from the area covered by the map are plotted.

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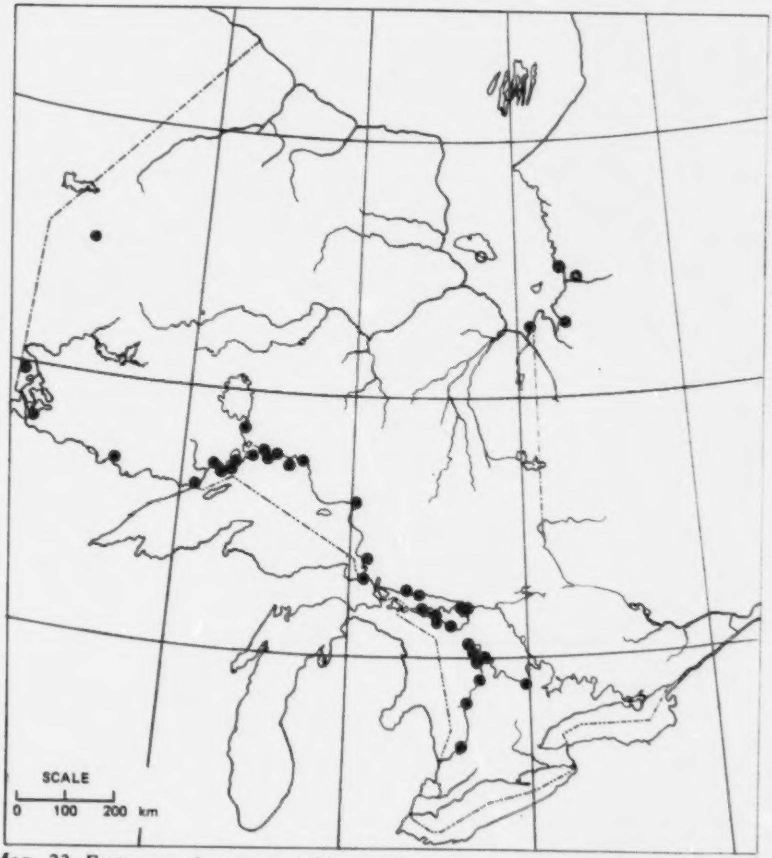
Map 22. *Festuca baffinensis.*

7. *Festuca saximontana* Rydb. (*F. ovina* var. *saximontana* (Rydb.) Gleason)

Plate 7, Map 23

Rocky Mountain fescue

Festuca saximontana is a densely tufted species with numerous early-maturing culms. It is abundant on the sandy shores, dunes, and crevices of exposed rocks (limestone, granite, or basalt) along Lake Huron and Lake Superior. It is a widespread prairie species in the west and it possibly



Map 23. *Festuca saximontana*. All known Canadian records from the area covered by the map are plotted.

migrated eastward into Ontario along ancient beaches and ridges of rock in the Lake Superior region, and then southward along the Lake Huron shores as far as Wasaga Beach and Grand Bend. It has been found at Sandy Lake in northwestern Ontario, but is not known to occur eastward until James Bay. A large gap in distribution occurs therefore between the northern Ontario stations and those in northern Quebec (southeastern coast of James Bay to Ungava and Labrador), suggesting that the latter region must have been reached by another route.

Numerous specimens from the settled areas of southern Ontario, inaccurately placed under the name, are referred to various alien species of *Festuca*.

8. *Festuca ovina* L.

Map 24

sheep fescue

Festuca ovina is apparently unable to become naturalized in Ontario despite the fact that, almost continuously since settlement, many seeds must have come in with commercial lawn mixtures from Europe. The only known specimens are from the Arboretum at Ottawa, from the site of a former woodland garden along the Rideau River nearby, and from Galt (Cambridge) (Herriot 1905), but others may exist.

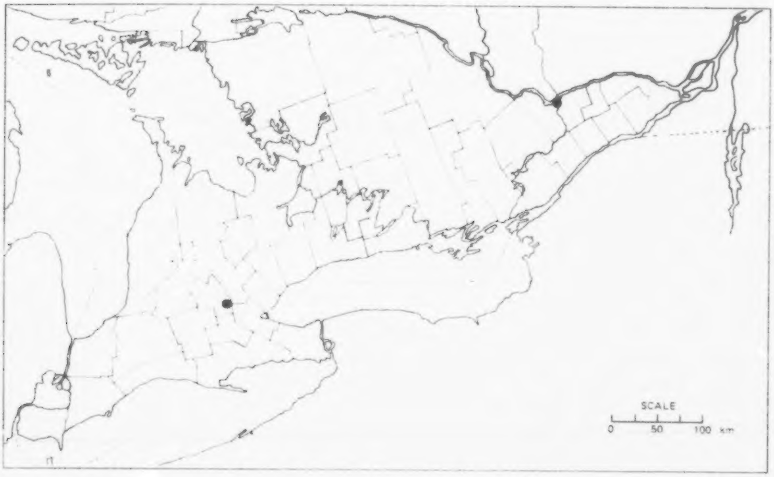
The status of *Festuca ovina* (in its strict sense) has been obscured by the inclusion of several alien (*F. tenuifolia, longifolia*) and native species (*F. saximontana, brachyphylla, baffinensis*) under this name, although sometimes as varieties.

9. *Festuca longifolia* Thuill. (*F. ovina* var. *duriuscula* auct. amer.)

Plate 7, Map 25

hard fescue

Festuca longifolia is a coarse, densely tufted grass common throughout the settled areas of the province, particularly the southwestern counties. It occupies sandy soils in old lawns, pastures, roadsides, and waste places so sterile that they seem inimical to most other plants. This grass was formerly introduced widely in lawn and pasture mixtures (it seeds freely and is easily harvested) under the guise of "sheep fescue," a proven turf species in Europe. It has persisted and is now completely naturalized. It is usually found infesting old cemeteries in the country, which are often located on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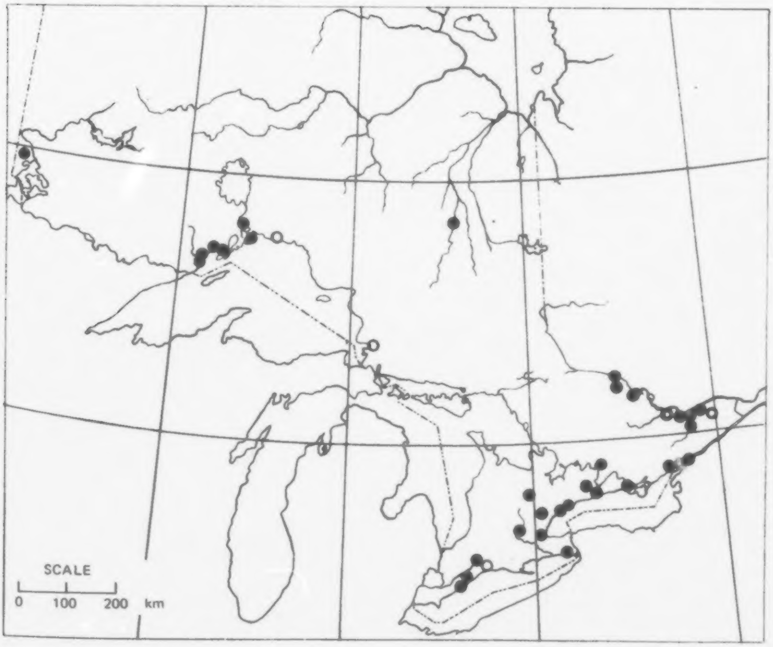
Map 24. *Festuca ovina.*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Map 25. *Festuca longifolia.*

warm, well-drained, sandy knolls ideal for the growth. Its coarse tufted habit, however, makes it undesirable for turf purposes.

This plant has long been called *Festuca ovina* var. *duriuscula* (L.) Koch in North America and elsewhere. This usage is shown to be erroneous (Howarth 1924, 1925) because the plant originally named *F. duriuscula* by Linnaeus was a member of the *Festuca rubra* group, not that of *F. ovina*. Consequently, the name *F. longifolia* Thuill. has usually been adopted in recent years for this species although other workers have used the name *F. trachyphylla* (Hackel) Krajina (*see* McNeill and Dore 1977).

Much variation is shown in the color of the foliage (green, blue green, or glaucous) and of the spikelets (yellow, green, blue green, or purple), and in the size and hairiness of the spikelets. Most plants have the lemmas smooth on the back and scabrous toward the tip (f. *longifolia*), but a few have densely hirsute lemmas and can be referred to as f. *villosa* (Schrader) Dore. This hairy lemma form was detected first in Ontario in 1904 in Mount Pleasant Cemetery, London, but has since been found at six other places ranging from Constance Bay west of Ottawa to Gananoque in Leeds County, Hamilton, Ridgetown in Kent County, and Thunder Bay.

10. *Festuca occidentalis* Hooker

Plate 8, Map 26

western fescue

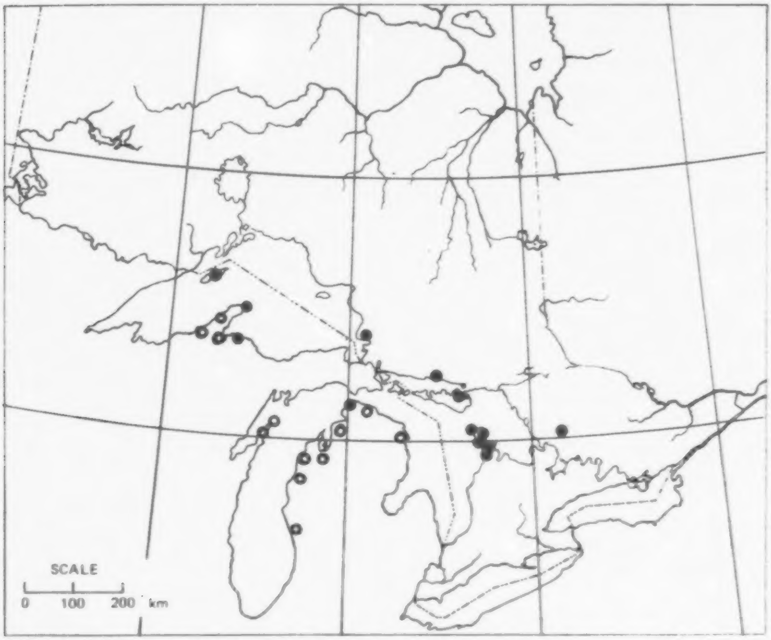
A native species highly localized in Ontario, *Festuca occidentalis* is abundant only in the Bruce Peninsula where it was first discovered by A. B. Klugh (Klugh 1911). It is also found at single stations near Dorset, Haliburton County; Little Current, Manitoulin District; Serpent River, Algoma District; on the shores of Lake Huron; and at the eastern end of Lake Superior. It is usually thought to be associated with rich deciduous woodland, but this is not the case in Ontario.

11. *Festuca rubra* L.

Plate 8, Maps 27–32

red fescue

Festuca rubra includes a complex of native and introduced variants, the classification of which is not yet well understood. The various literature reports of "*F. rubra*" are too difficult to assess and some even refer to species of "narrow-leaved fescue" (the *F. ovina* group).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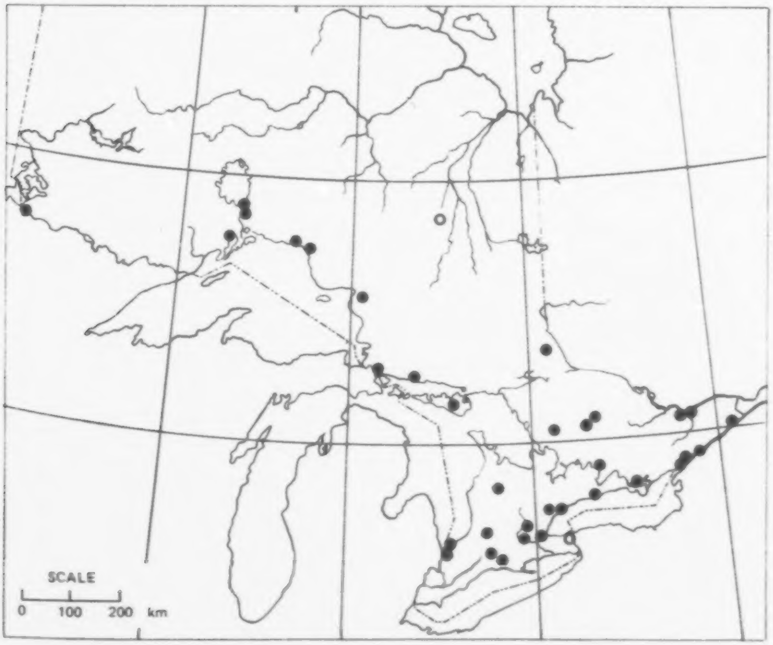
Map 26. *Festuca occidentalis*. All known records from the area covered by the map are plotted.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Map 27. *Festuca rubra* var. *rubra* and var. *commutata*.

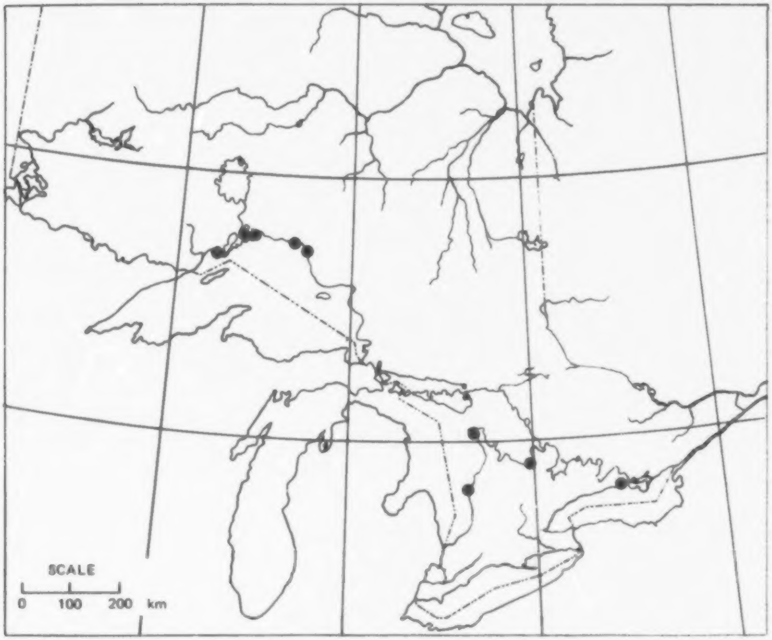
Because of the present lack of understanding of the variation within this species complex, no formal infraspecific classification can be adopted. In Ontario there are a number of variants characteristic of different habitats or geographical areas; these cannot always be satisfactorily distinguished, however, and the names usually given to them are often of uncertain applicability. These variants include the following:

(a) Introduced plants known commercially as "creeping red fescue." This variant has been extensively planted in recent decades for lawn and pasture purposes because of its dense and uniform, turf-forming properties. It has escaped from these seedings to fertile and moist soils, but appears only sparingly in southern Ontario, apparently because it is not so well adapted to dry summer conditions as it is to the moister conditions in eastern Quebec, where it dominates pastures and old fields and spreads spontaneously. As a pasture grass at Kapuskasing in northern Ontario it is particularly successful. This variant may be called var. *rubra* (var. *genuina* Hackel; var. *vulgaris* Gaudin) because it seems to represent the original European plant as named by Linnaeus. Forms with hairy spikelets, f. *squarrosa* (Fries ex Hartman) Holmberg, and with glaucescent foliage, f. *glaucescens* (Hartman) Holmberg, are also present in the introduced population.

(b) An introduced strain known commercially as "Chewing's fescue" that has long been offered in the trade. It is a tall, upright plant said to be originally selected in New Zealand and described as of "tufted habit," perhaps meaning "having very short rhizomes." It is often recommended for hay and pasture rather than for lawn purposes. It seems to have escaped only very sparingly and is apparently not well adapted to Ontario conditions. This variant is difficult to separate from var. *rubra* and is known as var. *commutata* Gaudin (var. *fallax* (Thuill.) Hackel; subsp. *fallax* (Thuill.) Nyman).

(c) Plants considered to be native on natural sand deposits along the shores of the Great Lakes in Ontario and spreading to adjoining sandy soil, such as railroad embankments. These plants have been found at Presqu'ile, the Bruce Peninsula, Wasaga Beach, Simcoe County, and the shores of Lake Superior. The stands formed on these soils are very loose, open, and not at all sod-like, even though very long runners are evident in the loose sand. The blades of this variant are rather slender, but are firm and glaucous; the culms are long (much longer than the foliage) and slender; and the spikelets are heavily glaucous over a usually purplish base. It has been referred to as var. *juncea* (Hackel) Richter, although this taxon was originally described from Europe.

(d) A native variant of the James Bay and Hudson Bay shores that has no particularly distinctive features to distinguish it morphologically from the Old World var. *rubra*. Apparently it is ecologically distinct from the "creeping red fescue" of commerce. It has never been formally recognized taxonomically.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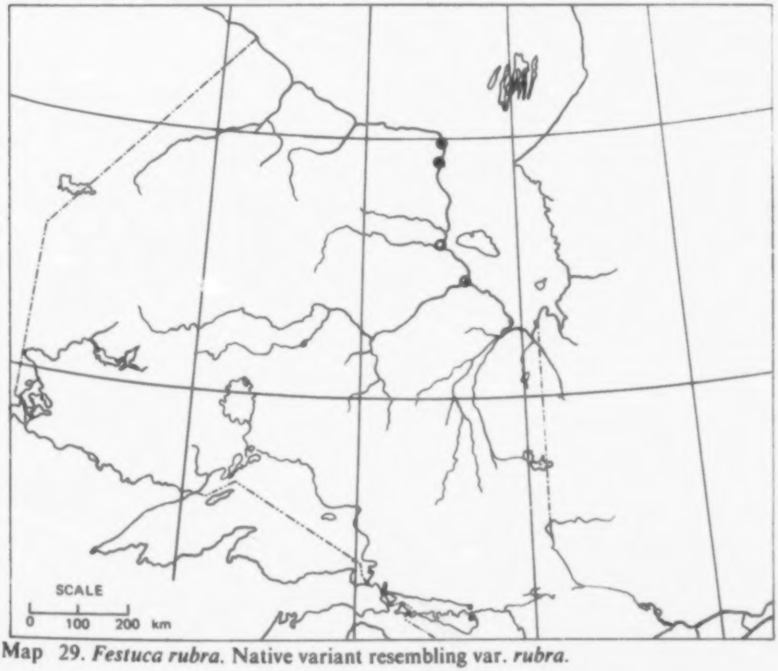
Map 28. *Festuca rubra* var. *juncea*.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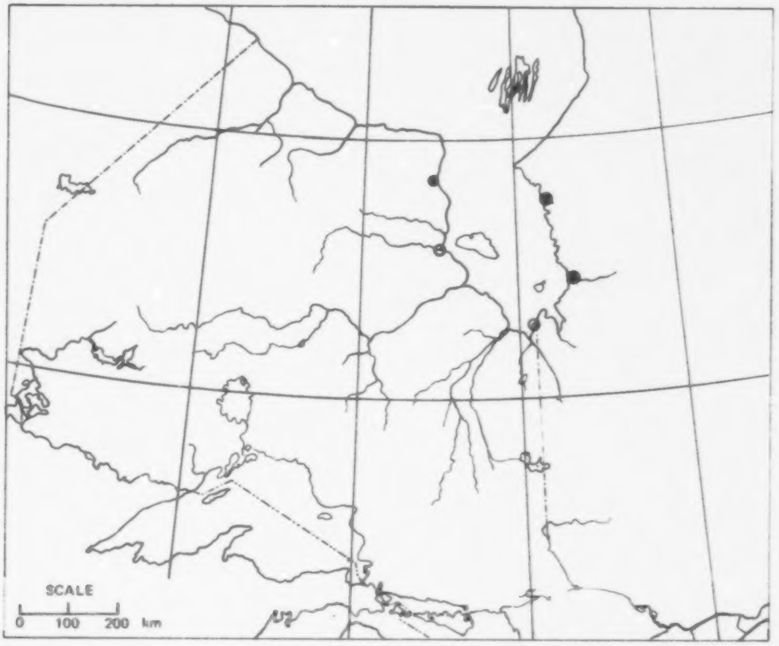
Map 29. *Festuca rubra*. Native variant resembling var. *rubra*.

(e) Native plants with densely hairy spikelets that also occur along James Bay and Hudson Bay; these have been called var. *arenaria* Osbeck ex Fries (var. *lanuginosa* Mert. & Koch), but they are certainly distinguishable from the European plants of sandy fields and shores to which the name was originally applied, and are probably better referred to var. *alaica* Drobov (= subsp. *arctica* (Hackel) Govorukhin) (*see* McNeill and Dore 1977).



Map 30. *Festuca rubra* var. *alaica*. All known records from the area covered by the map are plotted.

(f) A native plant of seashore marshes, this variant usually produces few inflorescences, each consisting of a sparse panicle with widely spreading, short branches and usually solitary large spikelets. This race is currently termed var. *megastachys* (Gaudin) Hegi (f. *megastachys* (Gaudin) Holmberg) but because the variety was originally described from Switzerland, the application of the name to our plants is questionable.

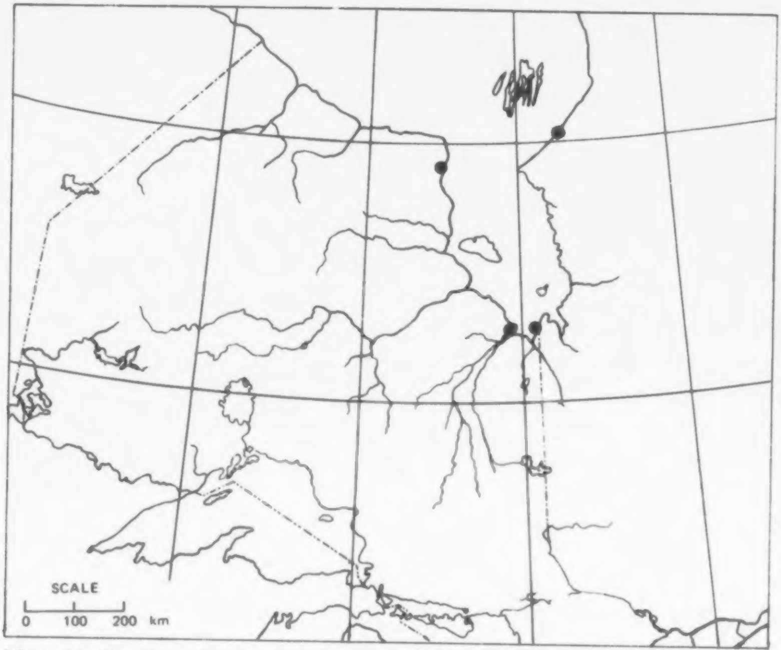
(g) A native proliferous variant of cold humid areas, such as Mt. Washington in New Hampshire, Cape Breton, the Gaspé Peninsula, Newfoundland, and Ungava Bay, is also found in the far northern part of Ontario. This variant is referable to var. *prolifera* (Piper) Piper ex Robinson (subsp. *prolifera* Piper, *F. prolifera* (Piper) Fernald). The collections of Dutilly, Lepage, and Duman made in 1954 include both the typical form, f. *prolifera*, with hairless spikelets from Attawapiskat River and from 34 miles (54 km) south of Cape Henrietta Maria, and the form with hairy spikelets, f. *lasiolepis* (Fernald) A. & D. Löve (*F. prolifera* var. *lasiolepis* Fernald), from Lake River (Nakitawisagi), James Bay; this form also occurs on the limestone bank of the lower Severn River. Living plants of var. *prolifera* from Fort Chimo, Ungava Bay, Que., have been grown at Ottawa for several years under various outdoor and greenhouse conditions and have retained their proliferous properties. New plants establish readily from the "viviparous" panicles when allowed to make contact with fresh soil by the sprawling of the slender culms. Although a few florets in the lower part of the panicle may sometimes produce anthers, it is clear that the proliferous character shown by most spikelets is genetically determined and not a direct response to latitude, habitat, or disease.

12. *Festuca scabrella* Torrey (*F. altaica* Trin. var. *major* (Vasey) Gleason)

Plate 8, Map 33

rough fescue

The sole Ontario stand of *Festuca scabrella*, detected in 1950 on sandy jack pine land adjoining Stanley Hill Cemetery, 25 km west of Thunder Bay, has now become well known, but the reason for its isolation, so far from the general range of the species across the northern prairies, is still a matter of speculation. A few other species of prairie affinity are also present at the site, and in some respects the situation has the aspect of a "bald" on a southwest-facing knoll in the forest. Another isolated occurrence, in Otsego County, Michigan, is on flat sandy pine terrain, but in this case, after inspection in 1964, establishment can be related to early lumbering activities and the use of western hay for the horses. In 1905 Herriot reported *F. scabrella* in waste places around Galt (Cambridge) as a migrant from the western prairies, but he preserved no specimen as evidence. The plant has not been encountered since in that area.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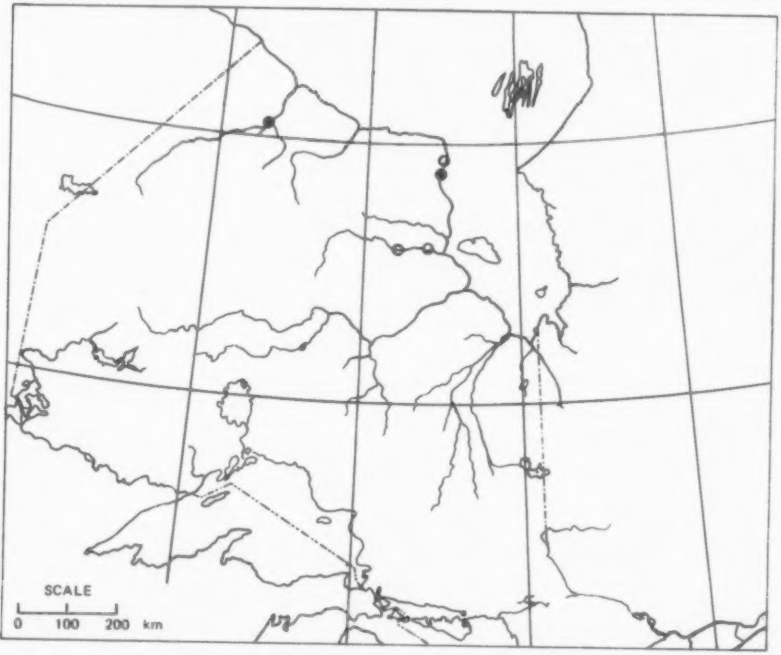
Map 31. *Festuca rubra* var. *megastachys*. All known records from the area covered by the map are plotted.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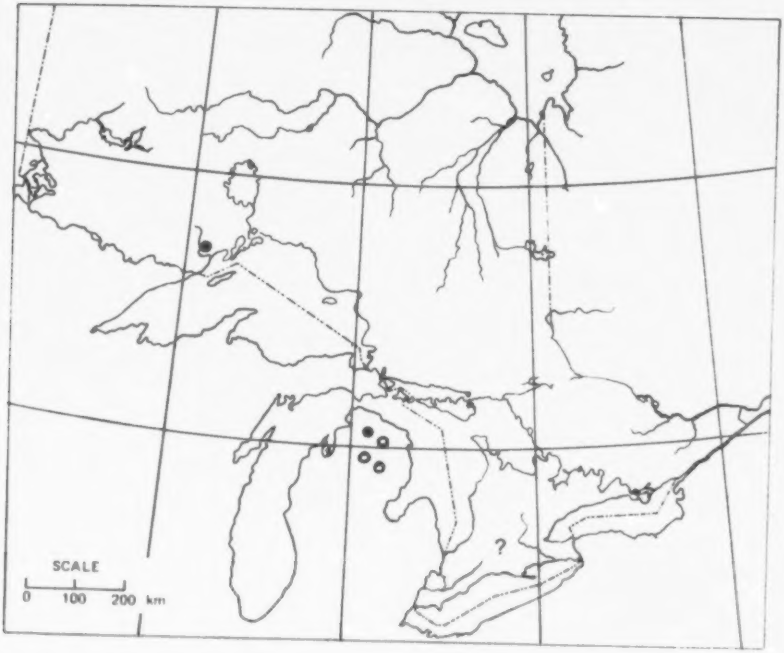
Map 32. *Festuca rubra* var. *prolifera*.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Map 33. *Festuca scabrella.* All known records from the area covered by the map are plotted. One doubtful record is indicated by a question mark (?).

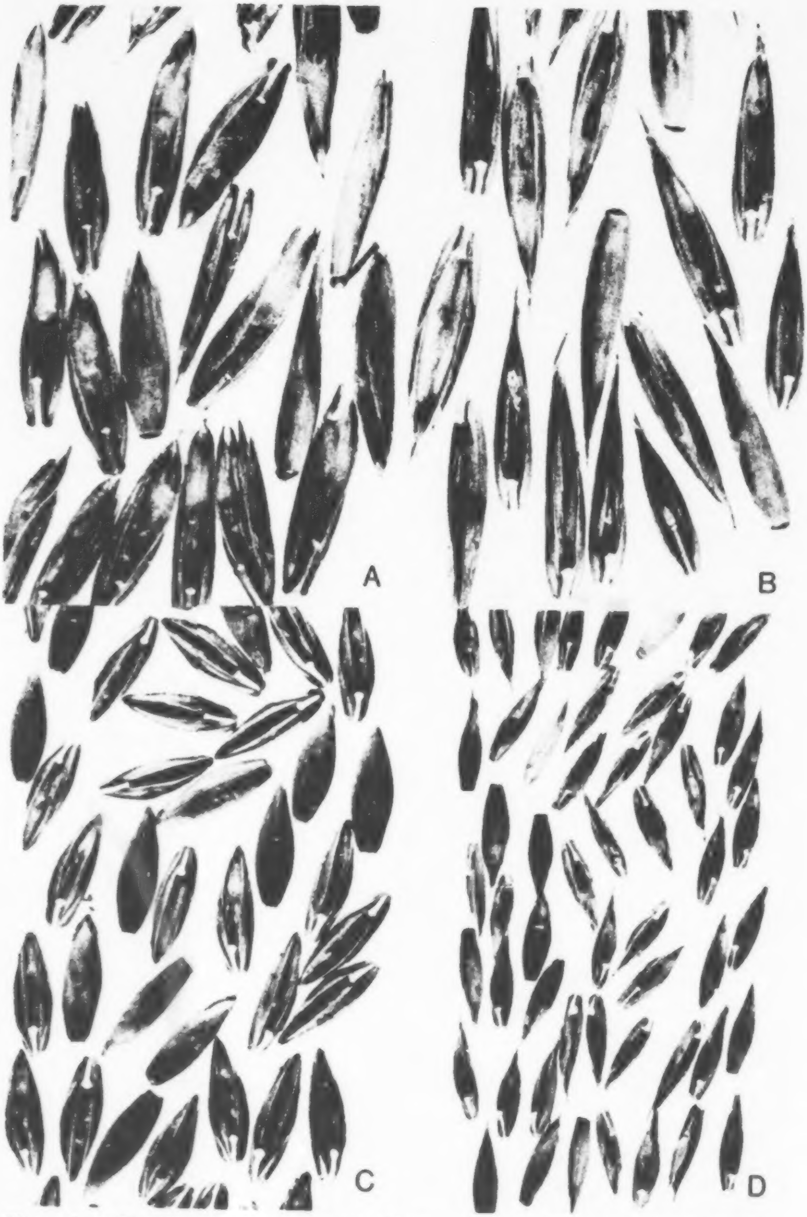


Plate 6. *A*, Florets of *Festuca pratensis* (Garton 6810); *B*, Florets of *F. arundinacea* (Moore 2245); *C*, Florets of *F. obtusa* (Dore and Sherk 20734); *D*, Florets of *F. tenuifolia* (Dore 16826).

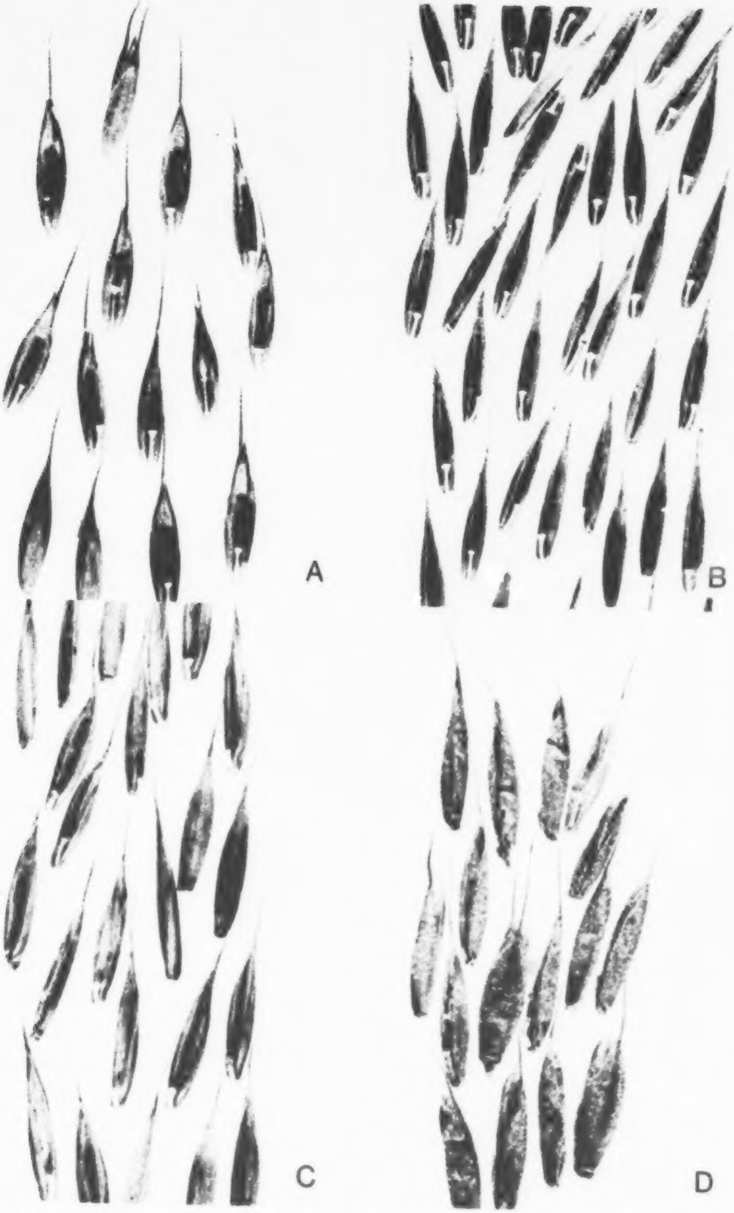


Plate 7. *A*, Florets of *Festuca brachyphylla* (Calder 2247); *B*, Florets of *F. saximontana* (Dore 21066); *C*, Florets of *F. longifolia* f. *longifolia* (Dore 17814); *D*, Florets of *F. longifolia* f. *villosa* (Dearness 1905).

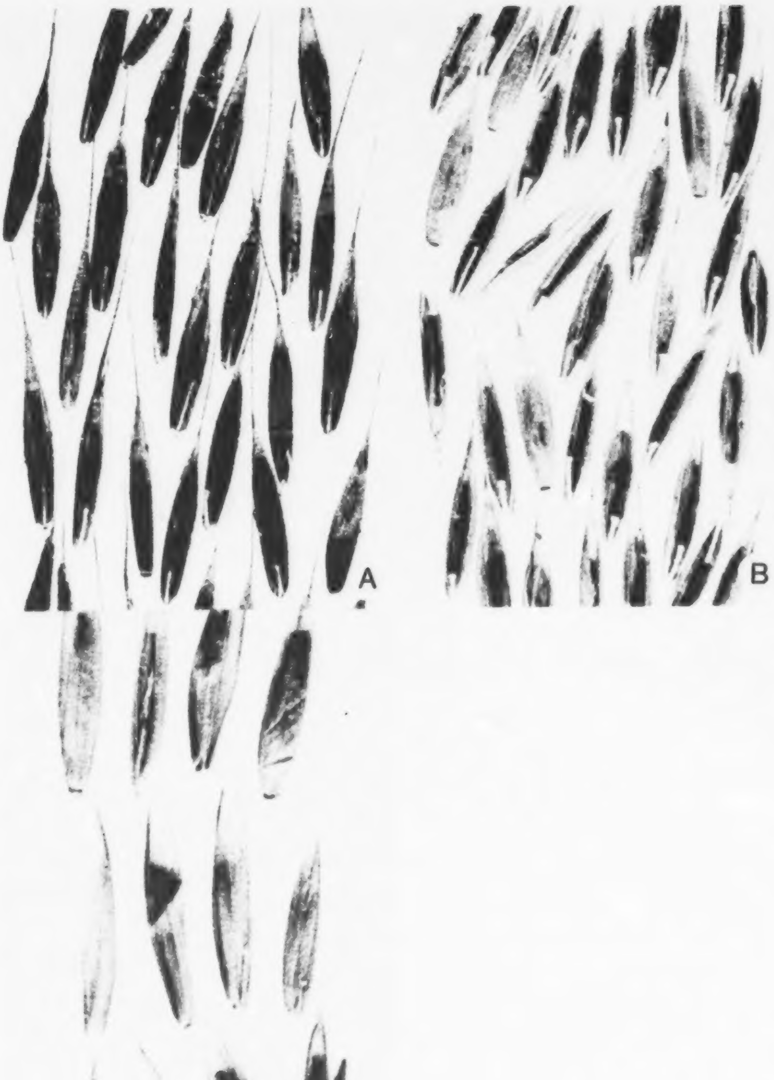


Plate 8. *A*, Florets of *Festuca occidentalis* (Dore 21065); *B*, Florets of *F. rubra* var. *rubra* (cultivated in Ottawa); *C*, Florets of *F. scabrella* (Dore et al. 10812).

3. Vulpia C. C. Gmelin

Pale green annual plants with short (up to 15 cm), erect, slender stems. Leaves small with inrolled hairless blades, less than 0.5 mm in width; ligule less than 1.5 mm long, membranous. Panicles narrow, almost spike-like. Spikelets generally single on short erect branches, 5- to 12-flowered. Glumes narrow, somewhat unequal and shorter than the lowest lemma. Lemmas narrow, their margins permanently inrolled around the cleistogamous flower, scabrous, fine-awned from the tip.

Hitchcock and Chase (1951) include *Vulpia*, a group of about 25 annual species of Europe, the Mediterranean region, and North and South America, as a section of the genus *Festuca*, which otherwise comprises perennials. We are following most modern grass systematic treatments (e.g., Hubbard 1948; Pilger 1954; Tateoka 1962) in maintaining *Vulpia* as a separate genus, a course adopted also by Fernald (1950) in *Gray's Manual* and by Lonard and Gould (1974) in their recent revision of the group.

1. *Vulpia octoflora* (Walter) Rydb. (*Festuca octoflora* Walter)

Plate 9, Map 34

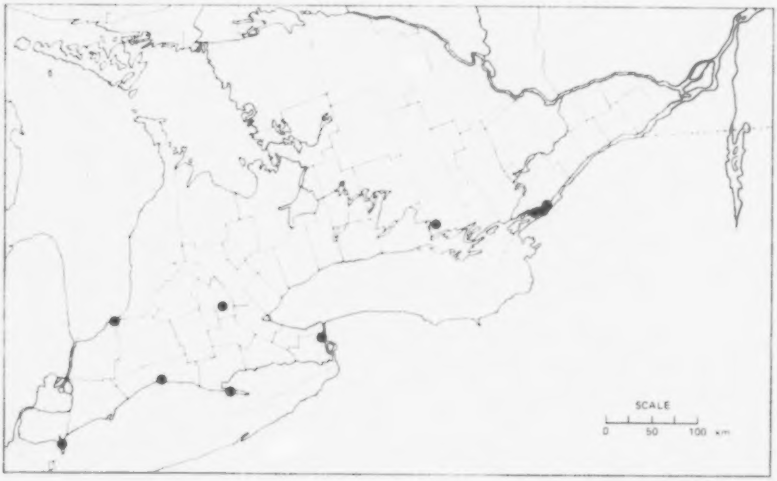
six-weeks fescue

Plants of *Vulpia octoflora* are often very short and spindly when crowded or growing in dry sterile ground, and have fewer than the 8 florets per spikelet as implied by the name. Our specimens are all referable to var. *tenella* (Willd.) Fernald, but in their recent revision of the genus Lonard and Gould (1974) do not think that this taxon can be satisfactorily separated from var. *glauca* (Nutt.) Fernald.

Six early collections exist: Oak Hills, Hastings County 1876; Port Stanley 1882; Point Pelee 1880, 1901; above Niagara Glen 1902; and Galt (Cambridge), north of Oliver's Pond 1903. These early specimens whose habitat was described as "sandy woods" might seem to suggest that the plant was native and already had a rather wide distribution. No collections were made in the same areas during the subsequent years of fairly intensive fieldwork and it is more likely that these occurrences represented sporadic and temporary introductions. Herriot (1908) said of his Galt (Cambridge) collection, "found in one locality only."

Recent occurrences, clearly adventive, include Long Point, Norfolk County, in 1951 and three of the Thousand Islands (Georgina 1961, Camelot 1966, and Hill 1969). These incipient infestations on out-of-the-way shorelines and islands frequented only by the yachting public suggest that the minute and prolific seeds are being transported by adhering to the camping gear of tourists. The species, a variable one, is considered to be native to North America, but has become widely distributed as a weed across the United States and is now prevalent in arid portions of the southern British Columbia and Alberta rangelands.

For Lambton County, Dodge in his 1915 list reported the grass as "frequent on dry and sandy ground, usually very short" but Gaiser and Moore (1966) present no evidence of its existence in the county. A specimen preserved at the University of Saskatchewan is labeled "Grand Bend Pinery, sunny hillside, 4 July 1965, H. Hood." This record is entered on the map, but the facts bear reinvestigation.



Map 34. *Vulpia octoflora*.

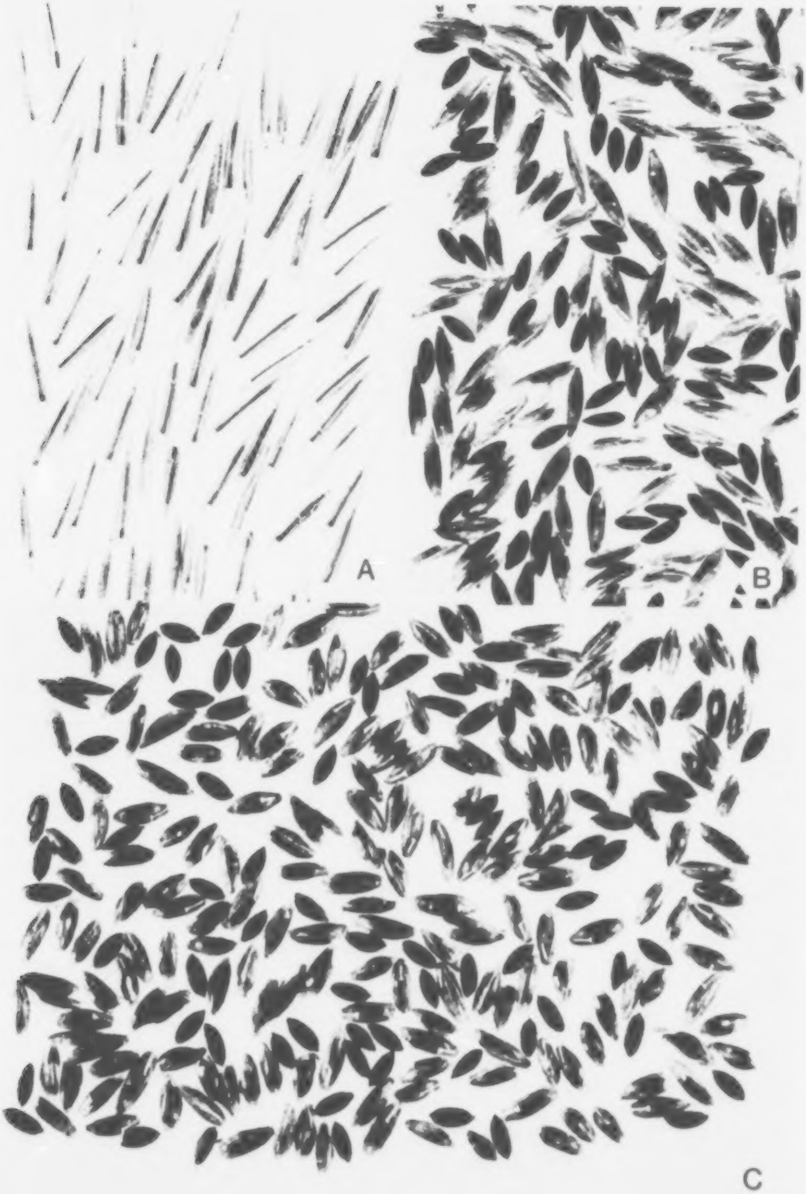


Plate 9. *A*, Florets of *Vulpia octoflora* (Dore 22272); *B*, Florets and caryopses of *Puccinellia nuttalliana* (Dore 19497); *C*, Florets and caryopses of *P. distans* (Dore and Marchant 34089).

4. Puccinellia Parl.

Perennial (some flowering in the 1st year), densely tufted grasses, without rhizomes but occasionally stoloniferous (*P.* ×*phryganodes*). Foliage hairless and smooth, or blades scabrous above and on margins near apex; sheaths thin, open to base; ligule thin, whitish, membranous. Panicle with ascending, spreading, or reflexed branches, bearing spikelets only in the upper half. Spikelets 3- to 7-flowered. Glumes very unequal, shorter than the lemmas, nerveless or obscurely nerved, the lower 1-nerved and the upper 3-nerved. Lemmas rounded on the back, subacute, obtuse or truncate, awnless, obscurely 5-nerved or nerveless, smooth or microscopically papillose on the back with a few matted hairs near base.

A. Plants low-growing and mat-forming, less than 10 cm high, mainly vegetative with extra-axillary ('infranodal') buds and branches; panicles meagre (with less than 20 spikelets), their branches smooth; glumes and lemmas not ciliolate; anthers 1.3–1.8 mm long, usually nonfunctional; widespread arctic species .... 4. ***P.*** ×***phryganodes***

A. Plants erect, 20–60 cm high, not creeping, with numerous panicle-bearing culms and buds all axillary; panicles ample (with more than 50 spikelets), their branches scabrous; glumes and lemmas ciliolate

  B. Lower glume 1.5–2.5 mm long; upper glume 2.5–3.5 mm long; lemmas 3–3.8 mm long, acute; anthers 1–1.2 mm long; grain 1.7–2 mm long; shore of James Bay .... 3. ***P. lucida***

  B. Lower glume 0.7–1.2 mm long; upper glume 1.2–1.7 mm long; lemmas 1.8–2.5 (–3) mm long, obtuse to emarginate; anthers 0.6–0.9 mm long; grain 1.1–1.3 mm long

    C. Glumes acute; lemmas narrowed to an obtuse apex, pale green or suffused with purple; culms mostly 30–50 cm high; Manitoba border and sporadically introduced from western provinces .. 1. ***P. nuttalliana***

    C. Glumes obtuse; lemmas broad with a somewhat rounded, truncate, or emarginate apex, generally deep purple and glaucous; culms mostly 15–30 cm high; introduced from Europe .... 2. ***P. distans***

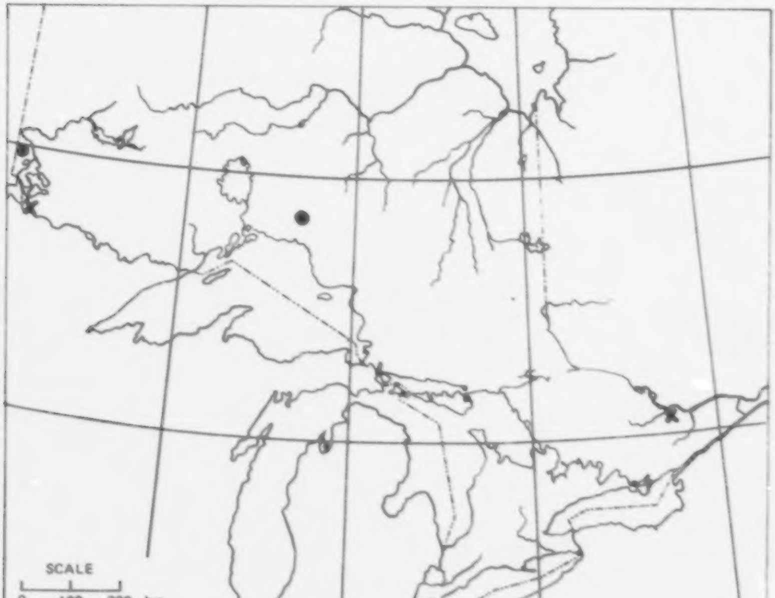
1. *Puccinellia nuttalliana* (Schultes) A. S. Hitchc. (*P. airoides* (Nutt.) S. Watson & Coulter)

Plate 9, Map 35

Nuttall alkali grass

Puccinellia nuttalliana, a western species, is found a few kilometres inside the Ontario boundary at Ingolf, Kenora District, which may represent the eastern limit of an extensive native range in saline areas of the western prairies. It is certainly introduced at Longlac, Thunder Bay District, where it is found along the railroad (Baldwin 1958).

Plants of the sterile hybrid, *P. nuttalliana* × *distans*, frequently encountered in southern Manitoba where both parents are abundant, were collected in the railyards at Rainy River in 1948 and in a highway seeding near Arnprior, Renfrew County, in 1959.



Map 35. *Puccinellia nuttalliana* (•). Locations of the hybrid *P. nuttalliana* × *distans* are indicated by a cross (×).

2. *Puccinellia distans* (Jacq.) Parl.

Plate 9, Map 36

reflexed saltmarsh grass

Puccinellia distans was introduced around the beginning of the century to the southwestern counties, and became established as a weed along cinder roadways and in the trampled salty ground around oil wells in Lambton County. The specimens distributed by Herriot from Galt (Cambridge), variously dated 1879, 1901, and 1910, may stem from what is possibly the original introduction: "Hespeler, waste heaps near Forbes' Mill" to quote from a sheet in Herriot's own herbarium. Other early introductions at Owen Sound and Sandwich, Essex County, 1901, Toronto Island 1902, and Guelph 1905, probably represent independent introductions from Europe. The more recent ones, such as those at Prescott, Grenville County (roadway near elevator 1950); Arnprior, Renfrew County (new highway embankment 1959); Milverton, Perth County; Tavistock, Oxford County (highway edges 1960); and Ottawa (sidewalk by a new building of agriculture Canada, 1969), seem to originate from Western Canada (where the species is now a common weed) mainly through the mixtures used in seeding roadside verges.

Along highways *P. distans* encroaches closer to the paved surface than other weed species, presumably because of its greater salt tolerance. It may become more prevalent in years to come. Seedlings established in the fall or early in the summer flower within the year, but the tufts persist as perennials.

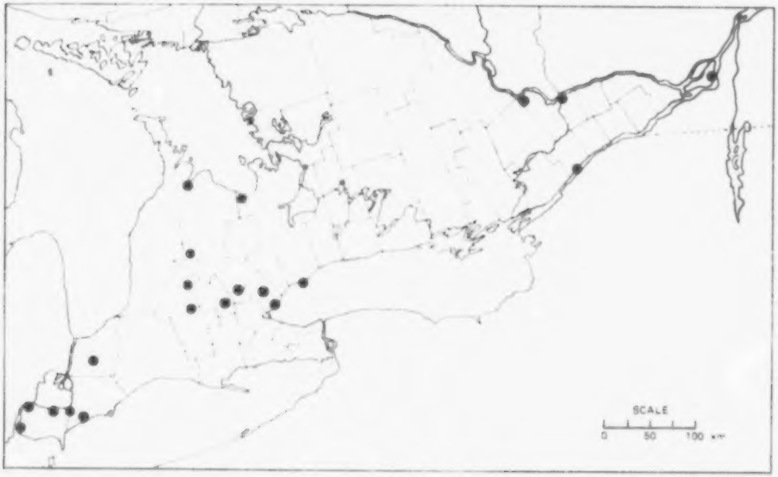
Almost all the Ontario specimens are of the narrower-leaved and shorter-flowered type scarcely distinguishable as var. *tenuis* (Uechtritz) Fernald & Weatherby (*see* Fernald and Weatherby 1916). One collection from Bronte Creek, Halton County (Neal in 1948), is more like the typical variety.

3. *Puccinellia lucida* Fernald & Weatherby

Map 37

lustrous saltmarsh grass

Puccinellia lucida is abundant on the tidal mud flats and brackish beaches of James Bay. Numerous collections from that area have been reported by Dutilly et al. (1954) under the names *P. lucida*, *P. macra* Fernald & Weatherby, and *P. laurentiana* Fernald & Weatherby. Those that have been examined cannot with satisfaction be separated into different taxa and are included here in the one species complex under the name *P.*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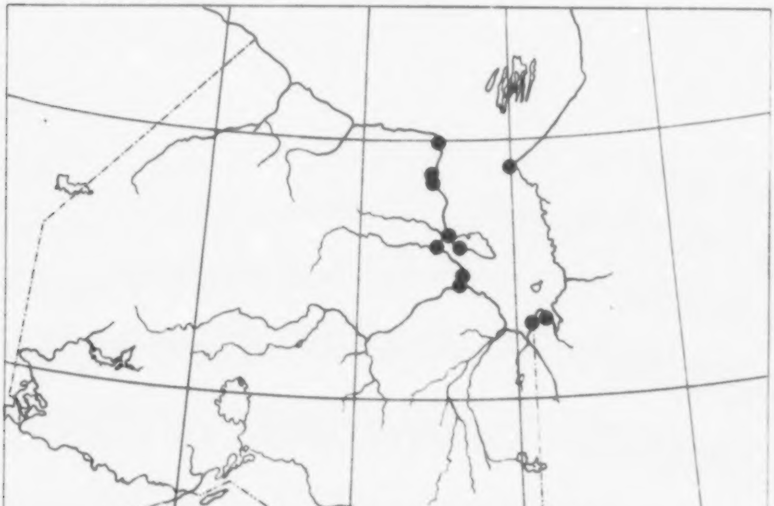
Map 36. *Puccinellia distans.*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Map 37. *Puccinellia lucida.* All known records from the area covered by the map are plotted.

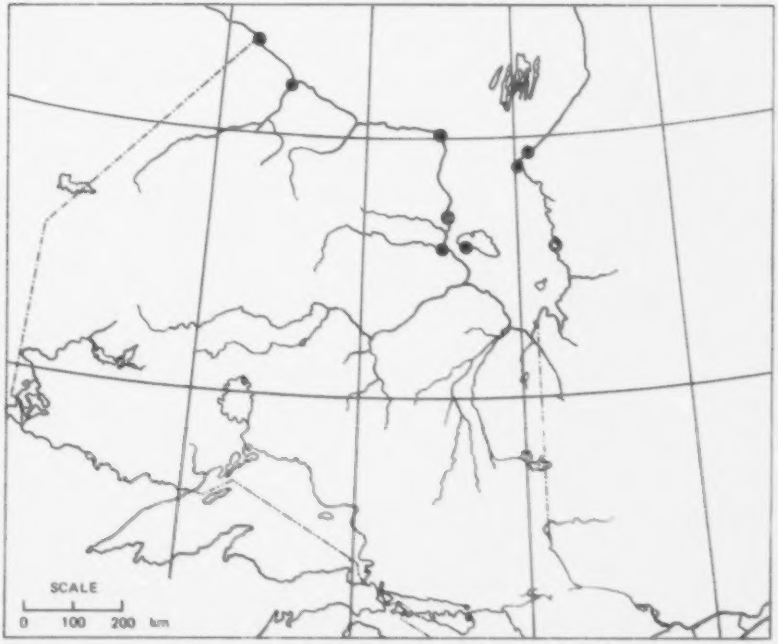
lucida. This species, like the other two to which Dutilly et al. attribute their James Bay specimens, was originally described from the Gulf of St. Lawrence. Plants of this species have been found at Churchill, Man., and presumably also occur along the intervening shores of Hudson Bay.

4. *Puccinellia* ×*phryganodes* (Trin.) Scribner & Merr.

Map 38

creeping saltmarsh grass

Puccinellia ×*phryganodes*, a grass of the northern seashore flats from Greenland to Alaska, is probably continuous in its distribution along Hudson Bay and James Bay in Ontario, but has seldom been gathered because of its sparse-flowering condition. It was first collected by Spreadborough in 1904 at Cape Henrietta Maria and was reported by Dutilly et al. (1954) as frequent along the coast of James Bay; other collections are known from the mouths of the Black Duck and Severn rivers on Hudson Bay.



Map 38. *Puccinellia* ×*phryganodes*. All known records from the area covered by the map are plotted.

The sterility of this grass has been known for some time and was attributed by Bowden (1961) to its being a triploid hybrid. Some morphological variation is reported from area to area and presumably the hybrid has been formed repeatedly from the species occurring in proximity, although the parentage is as yet unknown. Vegetative propagation is sometimes prolific and wide distribution along tidal shores is probably effected by fragmentation.

This hybrid is unusual among grasses in possessing infranodal branching.

5. Torreyochloa Church

Weak-stemmed perennials of wet habitats, spreading by procumbent culms rooting at nodes; rhizomes absent. Foliage hairless; blades finely ridged and scabrous above; sheaths split to base; ligule long, thin, membranous. Inflorescence a few-branched panicle of 3- to 7-flowered spikelets. Glumes thin, shorter than lemmas, the upper glume 3-nerved. Lemmas rounded on the back and distinctly scabrous all over, prominently 5-nerved (in contrast to the 7-nerved lemmas of *Glyceria*), awnless, with an obtuse membranous apex.

The genus *Torreyochloa* was established by Church (1949) for a small group of North American and East Asiatic species previously included in *Glyceria*, but distinguishable from that genus by the chromosome base number of 7 (not 10) as well as by the morphological features referred to in the generic key on p. 000 and in the preceding generic description. Clausen (1952) has suggested that the species of *Torreyochloa* be transferred to *Puccinellia* with which they share the chromosome base number of 7, but, as Koyama and Kawano (1964) note, the chromosomes of *Torreyochloa* are much larger than those of *Puccinellia*. With these chromosome differences and the very striking difference in habitat preference (*Puccinellia* in saline or alkaline localities), as well as the small morphological distinctions, notably the prominent lemma nerves, we prefer to maintain *Torreyochloa* as a separate genus.

1. *Torreyochloa pallida* (Torrey) Church (*Glyceria pallida* (Torrey) Trin.; *Puccinellia pallida* (Torrey) R.T. Clausen)

Plate 10, Map 39

Torrey's manna grass

Torreyochloa pallida has been divided into two varieties on intergrading characters, as follows:

Leaf blades 2–8 mm wide; spikelets 4- to 7-flowered; anthers 0.6–1 mm long .... a. var. ***pallida***

Leaf blades usually less than 3 mm wide; spikelets 3- to 5-flowered; anthers 0.3–0.5 mm long .... b. var. ***fernaldii***

1a. var. *pallida*

Var. *pallida* is commonest in the southern and southeastern portions of the species range and few specimens have been collected in Ontario. All are from moist or wet habitats at Carlsbad Springs, Regional Municipality of Ottawa-Carleton (Macoun in 1898 and 1911); Rideau Ferry, Lanark County (Cody and Dore in 1947); near Erinsville, Lennox and Addington County (Dore in 1951); and Moira River near Stoco, Hastings County (Dore in 1951). When plants from the Rideau Ferry locality were grown in the nursery at Ottawa on ordinary soil, they developed narrower blades and the prostrate habit characteristic of var. *fernaldii*, but the anthers remained of the larger size.

Chromosome number: $2n = 14$, Rideau Ferry, Lanark County, R. J. Moore in Church (1949).

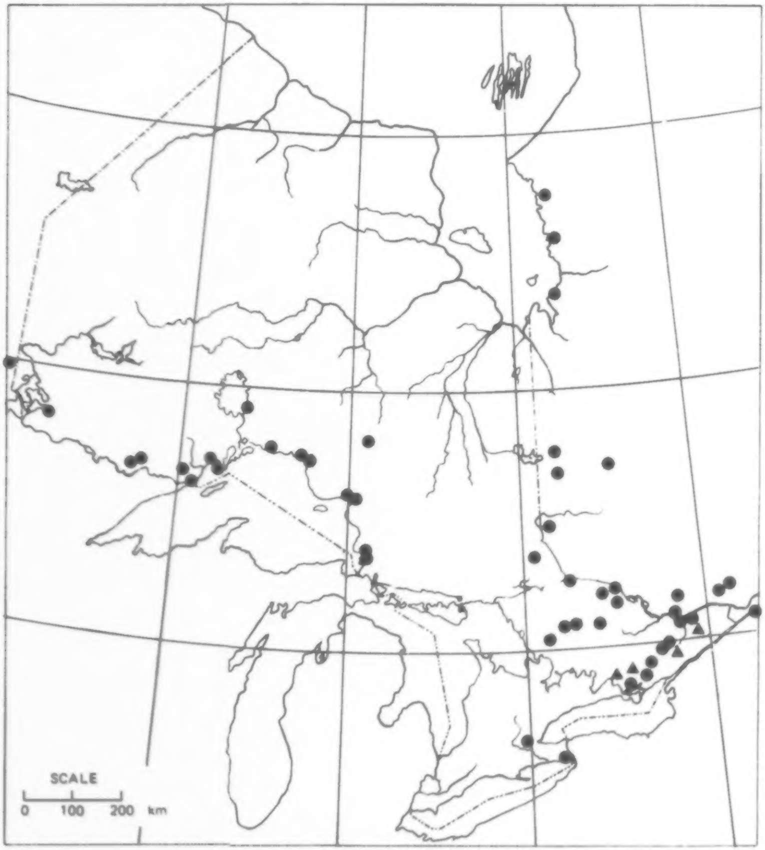
1b. var. *fernaldii* (A. S. Hitchc.) Dore ex T. Koyama & Kawano (*Glyceria fernaldii* (A. S. Hitchc.) St. John)

This is a more northern-ranging variety, extending from Nova Scotia to Lake St. John and James Bay in Quebec, and to northern Saskatchewan and British Columbia. In Ontario it is much commoner than var. *pallida*, being frequent in Carleton, Lanark, Hastings, and Renfrew counties, in Algonquin Park, at Mattawa and Temagami, and into the eastern Clay Belt area of Quebec. It occurs again along the north shore of Lake Superior, across Thunder Bay District to Rainy River District, and to Rennie in Manitoba. It is not recorded in the northernmost part of the province, and the station near Hearst, Cochrane District, around a lumber camp may be a local introduction. The grass is easily overlooked, because its sparsely produced panicles lie obscured among the luxuriant vegetative growth, and it is easily mistaken for *Agrostis palustris* (creeping bent grass). Nevertheless, it is assumed to be absent from the greater portion of south-central and southwestern Ontario where only two specimens have been collected over the years: at Welland (Macoun in 1901) and near Guelph (Dore and Gammon in 1946).

Chromosome number: $2n = 14$, Mer Bleue, Ottawa-Carleton Regional Municipality, Bowden (1960*a*).

At one time var. *fernaldii* was considered to be specifically distinct and is so treated, under *Glyceria*, in Hitchcock and Chase's *Manual* (1951).

Fassett (1946) showed that the diagnostic characters of the two taxa intergrade sufficiently for them to be best regarded as varieties of one species. Koyama and Kawano (1964) came to the same conclusion, but extended the concept of *T. pallida* to include two varieties from eastern Asia, which they refer to a different subspecies. In this treatment, the North American varieties belong to subsp. *pallida*. Voss (1966, 1972*b*), however, prefers "at least at present" to keep var. *fernaldii* specifically distinct, and, following Clausen (1952), transfers it to *Puccinellia* as *P. fernaldii* (A. S. Hitchc.) E. G. Voss.



Map 39. *Torreyochloa pallida* var. *pallida* (▲) and var. *fernaldii* (•). All known Canadian records from the area covered by the map are plotted.

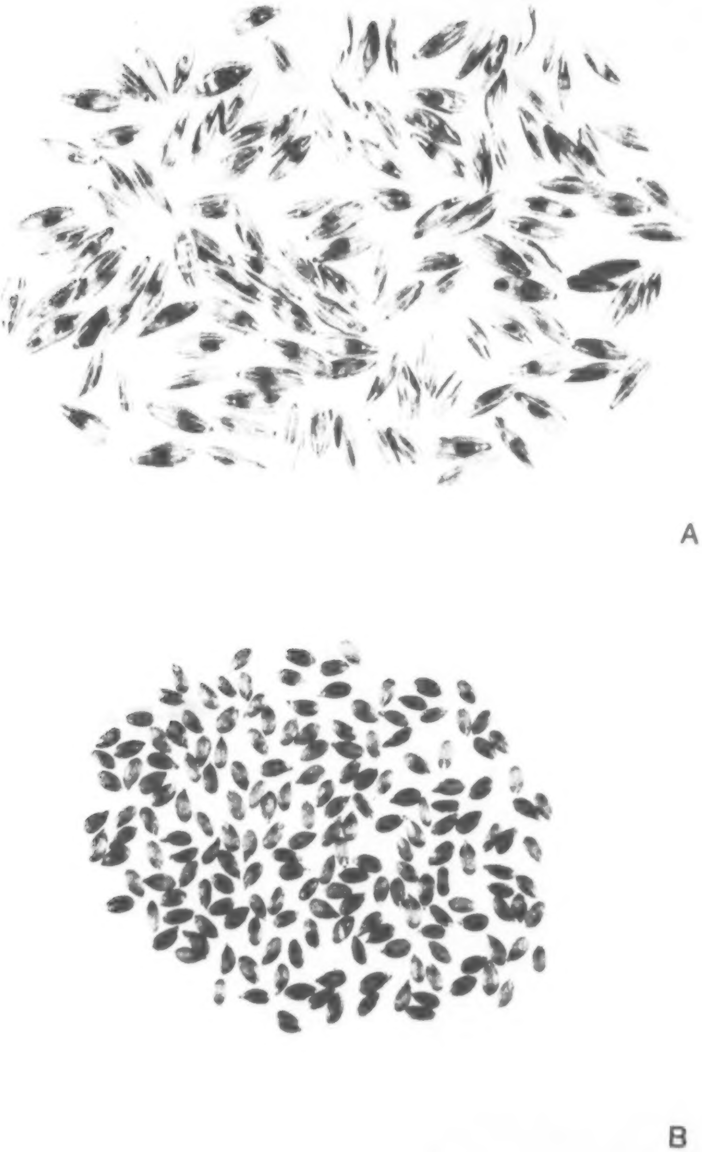


Plate 10. *A*, Florets of *Torreyochloa pallida* var. *fernaldii* (Dore 18348); *B*, Caryopses of *T. pallida* var. *fernaldii* (Dore 18348).

6. Glyceria R. Br.

Aquatic or wetland perennials with underground runners. Foliage hairless, smooth or scabrous, often spongy with air spaces; sheaths closed to near the top, rupturing readily; ligule thin, membranous; blades flat with only the midvein prominent. Inflorescence a panicle, usually open and pyramidal (contracted and slender in *G. borealis, septentrionalis,* and *melicaria*). Spikelets 2- to 12-flowered. Glumes membranous, usually whitish or translucent, shorter than the lemmas. Lemmas rounded and broad across the back, blunt, awnless, hairless (often scabrous), with 7 distinct, raised and scabrous nerves (nerves obscure and lemmas smooth in *G. canadensis* and *G.* × *laxa*).

- A. Spikelets linear, 10 mm long or longer, lying closely along the axis or branches of the panicle; pedicels shorter than the spikelets
  - B. Sheaths smooth
    - C. Culms 2–5 mm in diam at base; blades 2–4 mm wide (rarely to 6 mm); lower glume 1–2 mm long; upper glume 2–2.5 mm long; lemma of lowest floret 3–4 mm long, smooth or nearly so between the minutely roughened nerves; anthers 0.5–1 mm long .... 1. ***G. borealis***
    - C. Culms 4–8 mm in diam at base; blades 4–10 mm wide; lower glume 2–3 mm long; upper glume 3.5–4.5 mm long; lemma of lowest floret 4–5 mm long, uniformly scabrous over and between the nerves; anthers 1.1–1.7 mm long .... 2. ***G. septentrionalis***
  - B. Sheaths scabrous (with minute divergent bristles on the closely set ridges) .... 3. ***G. plicata***
- A. Spikelets ovate or oblong, less than 7 mm long, in a contracted or open panicle; pedicels as long as or longer than spikelets
  - D. Panicle contracted, elongate (more than 20 cm long), arching, with ascending short branches; lemmas with prominent veins; paleas bowed-out .... 4. ***G. melicaria***
  - D. Panicle open, pyramidal, with spreading or drooping branches
    - E. Nerves of the lemma smooth, not prominently raised; edges of the bowed-out palea visible beyond those of the lemma
      - F. Plants usually 60–90 cm high with 3–5 leaf blades; panicles sparsely branched; spikelets with 5–10 florets; lemmas 3–4 mm long; florets fertile; plants forming diffusely scattered populations; widespread .... 5. ***G. canadensis***
      - F. Plants usually 90–120 cm high with 6–8 leaf blades; panicles amply branched; spikelets with 3–6 florets; lemmas 2–2.5 mm long; florets sterile; plant forming dense circumscribed colonies; sporadic .... 6. ***G.*** **×*laxa***

E. Nerves of lemma minutely scabrous, prominent; palea not bowed-out, the edges not visible beyond those of the lemma
  G. Panicle usually less than 20 cm long; leaf blades 2–7 mm wide; spikelets 3–4 mm long; glumes 1 mm or less long ...... 7. ***G. striata***
  G. Panicle large and ample, 15–40 cm long; leaf blades 7–12 mm wide; spikelets 4–6 mm long; glumes more than 1 mm long
    H. Lower glume 1.2–1.5 mm long; panicle branches nodding at summit; sheaths smooth ...... 8. ***G. grandis***
    H. Lower glume 2–3 mm long; panicle branches more rigid; sheaths rough ...... 9. ***G. maxima***

1. *Glyceria borealis* (Nash) Batchelder

Plate 11, Map 40

float grass, northern manna grass

Glyceria borealis is a slender species characteristic of shallow water in lakes and streams and of mud holes in swamps or drainage ditches. It occurs throughout much of Ontario and is probably distributed more or less continuously across the unexplored northern parts of the province, complementing its wide distribution across Canada from Newfoundland to Alaska. Its abundance drops off in the southern portions of the province where water bodies are less permanent, and no records are known from many of the counties along Lake Erie and Lake Ontario.

Throughout the central and northern parts of the province its characters are constant, but on approaching the range of *G. septentrionalis* in the south, plants with intermediate characters begin to occur; some of these possess longer glumes and lemmas and on some the scabridity of the lemmas extends into the internerve region.

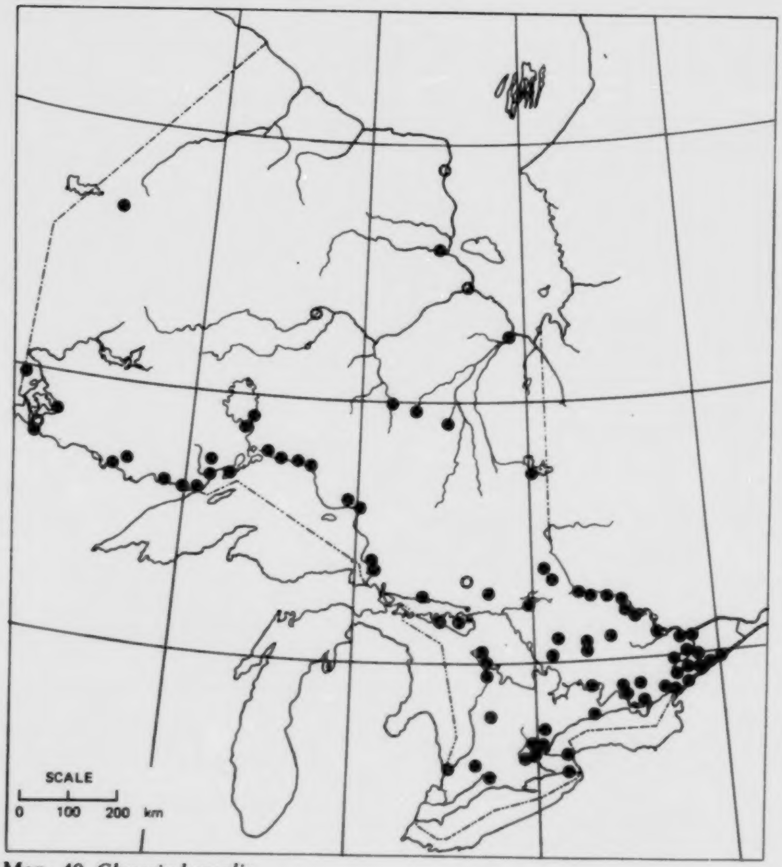
Most of the records under "*G. fluitans*" in Macoun's *Catalogue* (1888) can be assigned to this species or to *G. septentrionalis*. No specimens of the European *G. fluitans* (L.) R. Br. have been seen in Ontario.

2. *Glyceria septentrionalis* A. S. Hitchc.

Plate 12, Map 41

eastern manna grass, sweet grass

Glyceria septentrionalis is found in similar habitats to *G. borealis* but more particularly in stagnant pools, swamps, and ditches that dry up in midsummer. It is confined to certain southern counties with concentrations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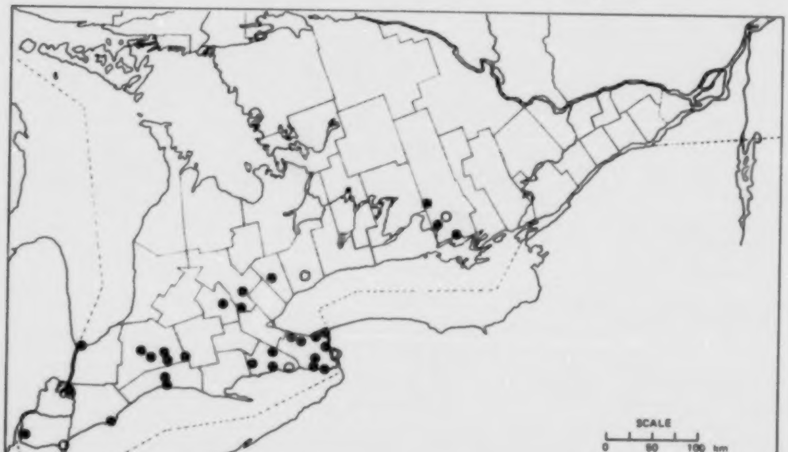
Map 40. *Glyceria borealis.*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Map 41. *Glyceria septentrionalis.*

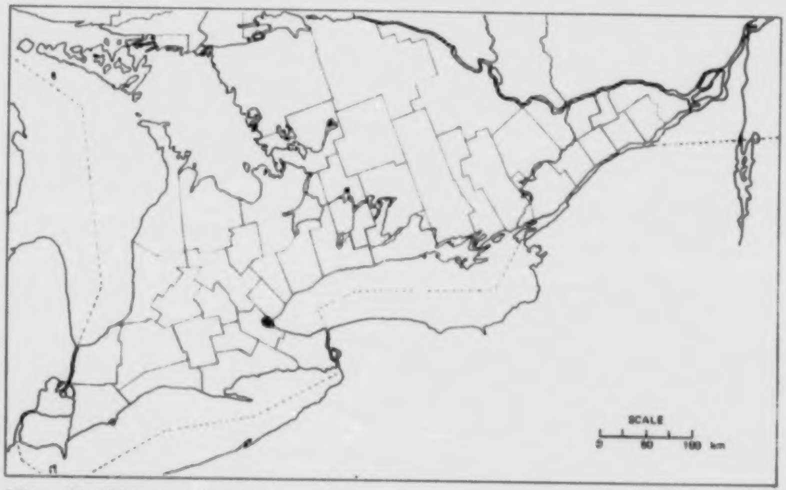
around London to Port Stanley, Galt (Cambridge) to Guelph, the Niagara Peninsula, and southwestern Hastings County. The Macoun collection, from "shallow water near Belleville" in 1878, has only recently been supported by other records from Hastings County.

Plants of this species are coarser in all their parts than those of *G. borealis*. The stout culms, 1.5–2 m in length, generally recline at their base but the panicles arch over so that the plants seldom stand higher than 1 m. Massed in open pools and swamps, the plants have a distinctive pale green color, and all their long slender panicles incline in one direction with the wind. Since these stands are palatable to livestock, they could provide forage in the summer when the mud becomes dry enough to allow cattle access to the area. Like *G. borealis*, the spikelets break up early, leaving only scale-like glumes on bare switch-like branches.

3. *Glyceria plicata* Fries

Map 42

A native of Europe, North Africa, and western Asia, *Glyceria plicata* is distinguishable from the previous two species by its rough or minutely hairy leaf sheaths. This character and its shorter lemmas (3.5–5 mm) and anthers (1–1.5 mm) distinguish it from another European species, *G. fluitans* (with lemmas 6–7.5 mm and anthers 2–3 mm). Although not known from Ontario, *G. fluitans* is naturalized in Newfoundland, Nova Scotia, and British Columbia.



Map 42. *Glyceria plicata.*

G. plicata is known from only one locality in Ontario, a creek in the Arboretum of the Royal Botanical Garden, Hamilton, where it was collected in 1955. It is also recorded from Nova Scotia.

4. *Glyceria melicaria* (Michaux) Hubbard

Plate 12, Map 43

long manna grass

A distinctive, slender, and leafy species of moist rich woods, *Glyceria melicaria* often forms large stands bordering cold springs. It has a restricted distribution in the province and for a long time was only known from two indefinite localities, "Nation River" (White in 1889) and "Petawawa River, Algonquin Park" (Macoun in 1900). The former is supported by an early collection at Casselman in Russell County (Scott in 1892) but by no other finds in this or adjacent counties. Several later collections, however, confirm the Petawawa River record and extend the present distribution to adjoining Parry Sound and Muskoka districts.

The species is more abundant and continuous in its distribution north of the Ottawa River and eastward across Quebec to Nova Scotia. The pattern suggests that *G. melicaria* migrated westward across the Shield immediately after its exposure from the ice and reached as far as the Nipissing area. Its occupation of the southeastern counties of Ontario was prevented by the Champlain Sea and by the time this sea had retreated, the warmer and drier climate may have restricted its spread. Its present-day incidence in Ontario and adjacent Quebec as discreet patches (perhaps clones) in cold moist habitats suggests that it is a relict of the boreal period.

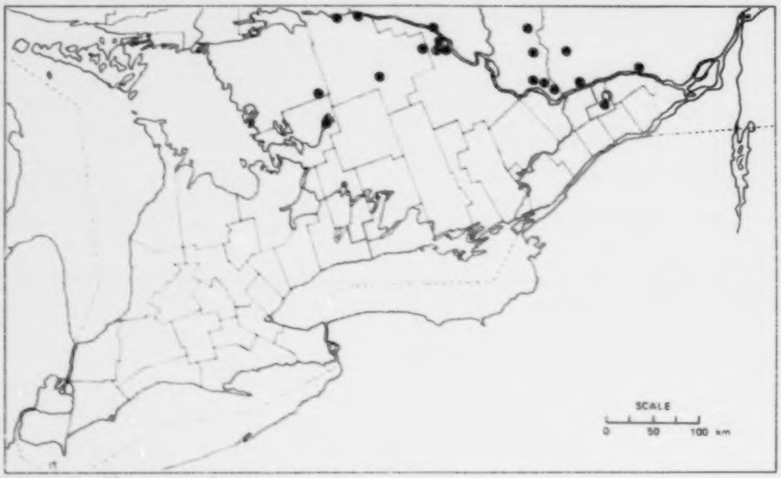
A record in Dodge (1915), "reported by Prof. Macoun as noticed in woods near Sarnia; apparently rare," should be disregarded.

5. *Glyceria canadensis* (Michaux) Trin.

Plate 13, Map 44

rattlesnake manna grass

Glyceria canadensis is a handsome grass of shallow water and mucky soil along the sedgy margins of lakes and streams, and is sometimes abundant in open swales especially if the soil has become disturbed. It is rather common across the province wherever acid or boggy conditions prevail. However, it apparently does not extend beyond Cochrane in the north, and in the south it is absent from large sections where the limestone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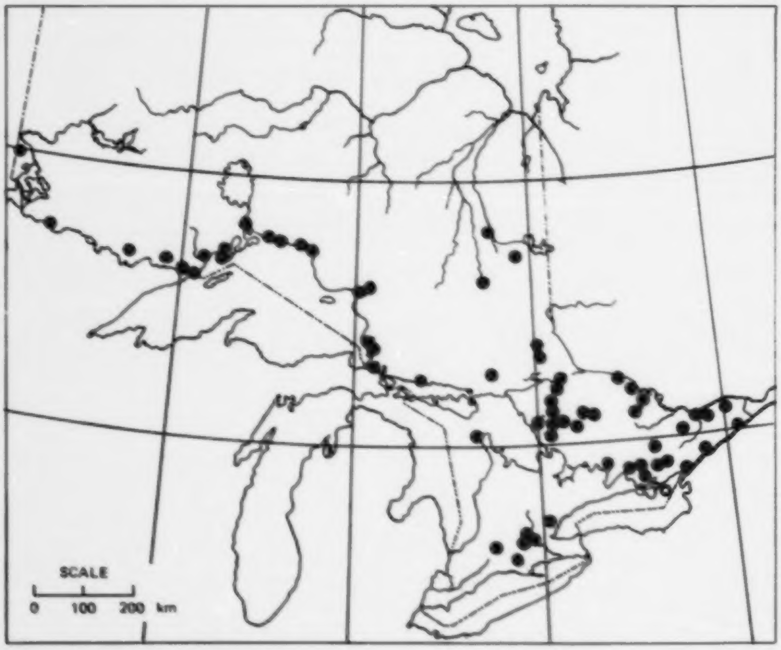
Map 43. *Glyceria melicaria.*



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200 km

Map 44. *Glyceria canadensis.*

creates calcareous conditions or ready drainage. Occurrences in the counties centering around Waterloo County are confined to acid swamps where the plant may be considered a relict of boreal conditions. The Lambton County record of Dodge (1915) should be discounted. The pattern of distribution is similar to that of *G. borealis* although the range is not as extensive.

G. canadensis is interesting in that its panicle is exserted before the spikelets have attained their full size. Consequently, preflowering specimens have narrow closed spikelets and small florets, a condition that led Dr. Malte to label several specimens in the National Herbarium "var. *parviflora*," a name he did not publish. It has also led to the misidentification by others of immature specimens as *G.* ×*laxa*.

The spikelets of *G. canadensis* are commonly attacked by insects that bore holes in the palea and destroy the developing grain. The anthers are small (about 0.5 mm long), generally deep red-purple, and contain good pollen grains.

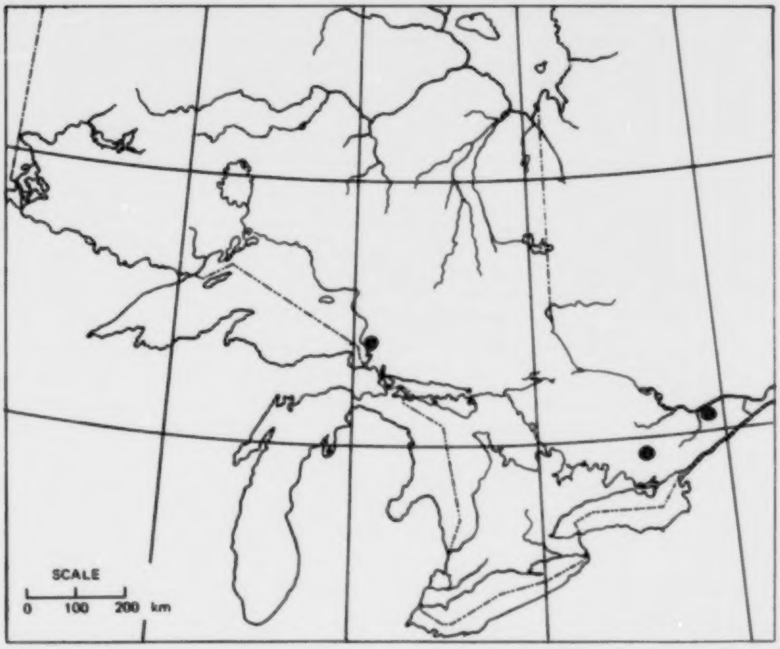
6. *Glyceria* ×*laxa* (Scribner) Scribner (*G. canadensis* var. *laxa* (Scribner) A.S. Hitchc.; *G.* ×*ottawensis* Bowden)

Map 45

loose-panicled manna grass

Although originally described as a species, *Glyceria* ×*laxa* is now considered to be an interspecific hybrid that has arisen spontaneously at each point where it occurs in nature. Numerous collections have been made in Eastern Canada, especially in Nova Scotia, but only two are known for certain from Ontario: one near Blackburn (about 13 km east of Ottawa) and the other at Corbeil Point in the Batchawana Bay area of Lake Superior (Taylor 1938). The report of the hybrid (as *G. canadensis* var. *laxa*) from Waterloo County (Montgomery 1945) is probably based on specimens now referred to *Poa saltuensis* and *Festuca obtusa*.

By its comparative features, *G.* ×*laxa* has as one of its parents *G. canadensis* ($2n = 60$) and the other *G. grandis* ($2n = 20$) or possibly *G. striata* ($2n = 20$). At the Blackburn site, where the three species occur in considerable profusion in wet pastureland and alder thickets bordering the Mer Bleue peat bog, the hybrid has been studied in some detail (*see* Bowden 1960*a*; McNeill and Dore 1977). A plant that may be of similar hybrid nature or a backcross with *G. canadensis* has been collected at Sharbot Lake, Frontenac County. It has spikelets characteristic of *G. canadensis* but is much taller and more leafy than that species, and has some abortive pollen.



Map 45. *Glyceria* ×*laxa.*

7. *Glyceria striata* (Lam.) A. S. Hitchc.

Plate 13, Maps 46 and 47

fowl manna grass

Glyceria striata is found throughout the province, except for possibly the far northwest, inhabiting damp places in woods, bog and stream margins, wet pastures, and ditches. This species had long been familiar as *G. nervata* (Willd.) Trin. until it was pointed out by Hitchcock (1928) that the name *G. striata*, based on *Poa striata* of Lamarck (1791), took precedence over *G. nervata* based on *Poa nervata* of Willdenow (1797).

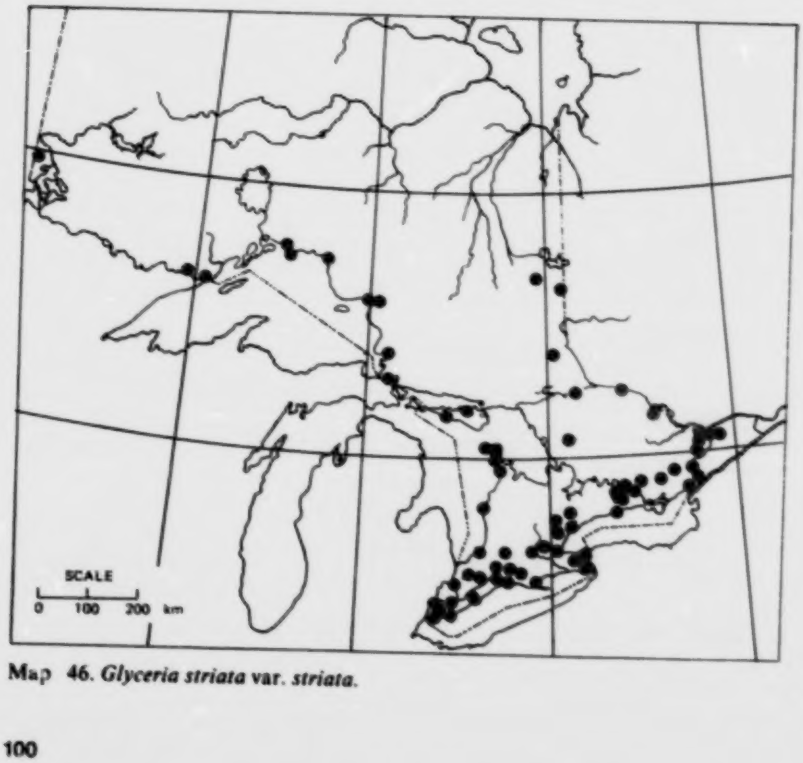
Considerable variation is exhibited by this species giving rise to a complex infraspecific nomenclature. Much of this variation is due to environmental influence and not worthy of taxonomic consideration. Two rather distinctive varieties, however, are present and these can best be compared when they are found growing together in the open or when planted side by side in an experimental plot. In shady habitats the distinctions are not as sharp and many specimens collected in woods are difficult to assign, although most seem to be referable to the typical variety. It is suspected that the varieties are interfertile and intermediates occur.

Plants (in open) about 1 m high; leaf blades flat, up to 7 mm wide; panicle ample, 10–30 cm long; spikelets usually green; lower lemmas 1.5–1.8 mm long .... a. var. ***striata***

Plants usually about 0.5 m high; leaf blades generally folded, up to 5 mm wide; panicle sparse, 5–15 cm long; spikelets generally dark purple or purple-tinged at tip; lower lemmas 2–2.2 mm long .... b. var. ***stricta***

7a. var. *striata*

This is the more abundant variety in southern Ontario and is the only one found in many areas in the southwestern counties. In deep woods where it is often the only grass at the site of springtime pools, the plants have delicate panicles of drooping branches and even smaller lemmas (1.2–1.5 mm), and the vegetative shoots stand in contrast with their distichous spray of leaves. Such plants have been distinguished as another variety (under the name *Panicularia nervata* var. *parviglumis* Scribner & Merr.), but appear merely to represent a phenotypic response to the environment.

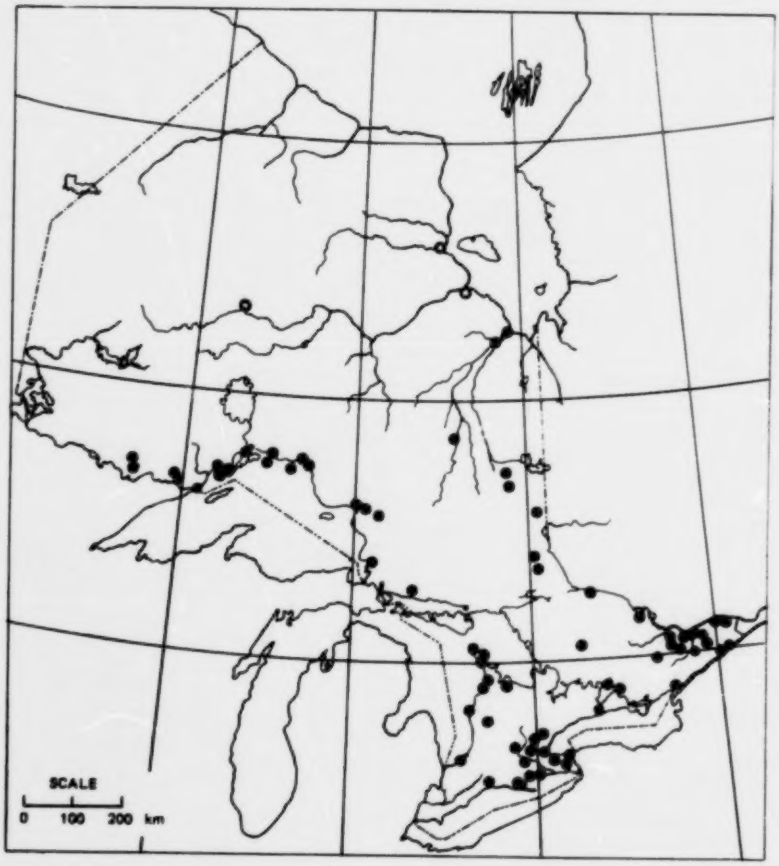


Map 46. *Glyceria striata* var. *striata*.

7b. var. *stricta* (Scribner) Fernald

Var. *stricta* is the sole variety in some of the southeastern counties and north of the Clay Belt and is a significant component of pastures on wet soil. It flowers earlier than var. *striata* and is in full bloom when the panicles of that variety are still partly included.

A single specimen collected in a low meadow at Shady Nook, 5 km south of Pembroke, has completely green, rather than purple-tinged spikelets and leaf sheaths, an unusual color condition for this variety.



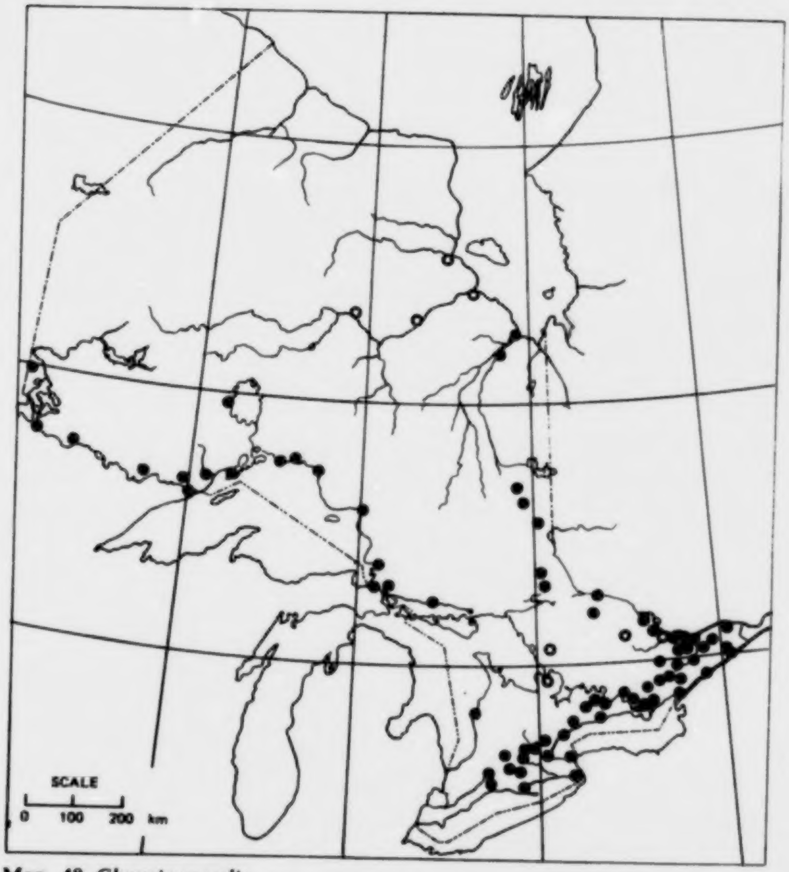
Map 47. *Glyceria striata* var. *stricta*.

8. *Glyceria grandis* S. Watson

Plate 14, Map 48

American manna grass, tall manna grass

Glyceria grandis, a tall, broad-leaved species of ditches and shallow water, is the largest of our native manna grasses. It is especially common in the southeastern and south-central parts of the province, although it extends to the northern shores of Lake Superior and "all around James Bay and north to York Factory" (Macoun 1888, under the name *G. arundinacea*).



Map 48. *Glyceria grandis*.

It is apparently rare or absent in the southwestern section of the province, from Georgian Bay to western Lake Erie, and is known definitely only from a creek at Clark Point on Lake Huron where a few isolated plants were found in 1948. A record from Wingham in Huron County needs verification and the species has not been reported in lists made at Wiarton, Sarnia, Wallaceburg, Tilbury, and Port Alma and is not mentioned for the Bruce (Krotkov 1940) or Pelee (Dodge 1914) peninsulas, yet Dodge (1915) records it for Lambton County as "frequent in wet meadows, ditches and damp streambanks" without supporting specimens. At Coldbrook, Simcoe County, a solitary patch was seen in a newly graded ditch in 1948, and the only record from the Muskoka District is at Three Mile Lake where wildfowl food plants had been planted. It seems that this freely seeding species is establishing itself in new areas beyond its previous range.

The forma *pallescens* Fernald is a rare albino variant with yellowish green panicles even when it is growing in full sunlight. At the time from just before to just after flowering, it contrasts strikingly with the typical purple form, with which it is always found, and is easily detected. Nothing is yet known about the inheritance of the panicle color. Presumably the plant maintains itself by vegetative means and spreads out into circular patches. The variant was first found in Ontario in 1944 near Woodstock; and later near Ottawa at Blackburn and Hazeldean; at Oconto, Frontenac County; and at Hamilton. Pale green plants referable to the typical f. *grandis*, develop in heavily shaded locations and can be distinguished from f. *pallescens* by their fewer (3- to 4-flowered) spikelets and shorter (1.8–2.0 mm) lemmas. In f. *pallescens* the spikelets are 4- to 6-flowered and the lemmas 2.0–2.4 mm long.

Plants of *G. grandis* infected with the smut *Ustilago longissima* often attain taller stature than healthy plants, and continue to bear leaves at the top of a stem devoid of an inflorescence.

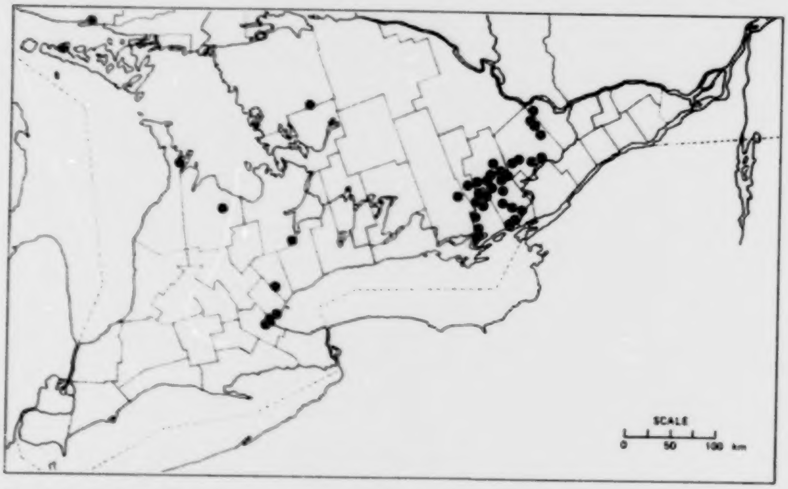
9. *Glyceria maxima* (Hartman) Holmberg (*G. spectabilis* Mert. & Koch)

Plate 14, Map 49

English water grass, sweet reed grass

Glyceria maxima, a naturalized manna grass that grows to more than 2 m in height, surpasses the native *G. grandis* in stature and in the size of the blades, panicles, and spikelets, but otherwise there is much similarity. Its presence in North America was first detected in 1943 when a large stand was found in a swamp near Brooke, southwestern Lanark County (Dore 1947). Earlier unrecognized collections, however, had been made in Ontario in the vicinity of Hamilton, at LaSalle Park by Shepard in 1940 and from the "shore of Lake between Hamilton and Dundas" by Soper in 1941.

Judging by the comment of W.W. Judd that this grass is one of the commonest plants in the Dundas Marsh (growing in 1–3 cm of water) and by subsequent collections from numerous parts of the area, establishment must have started many years earlier, probably when the old Desjardins Canal was in use.



Map 49. *Glyceria maxima.*

Further observations in the vicinity of Brooke show that stands occur westward along Highway 7 as far as Kaladar in Lennox and Addington County. They are concentrated and occupy large areas of wetland in the granitic terrain of central Frontenac County around such places as Sharbot Lake, Tichborne, Parham, Mountain Grove, Arden, and Oso. In the southern part of the county in the valley of Collins Creek east of Westbrook, there is a very large stand and the great mixture of clones displayed there may indicate that this was one of the original sites of introduction from which those in the interior of the county were derived. The stands near Napanee, however, might also have been from an early importation from Europe in the 1780s when the town was settled.

Some evidence of deliberate planting by transfer of sods was obtained from old-time residents of the interior who referred to *G. maxima* as "English water grass," and recognized its value as fodder for cattle. For example, a stand near Battersea, northeast of Kingston, is known to have been established from material gathered at Sharbot Lake in 1940. This and other evidence shows that the grass was popular among farmers in the general region.

Along the Mississippi River, the grass is rapidly invading the shores, perhaps from a clone originally established in the vicinity of Almonte (Gutteridge 1954). Its spread, indicated by the uniformity of stands, is mainly by vegetative means, and to eradicate it would be a difficult undertaking since the rhizomes are coarse and buried deep in the soft organic soil.

Montgomery (1956) refers to the history of a stand on Manitoulin Island.

At present the species is known to occur in the New World only in Canada, mainly in Ontario, with single stands reported in British Columbia and Newfoundland. It is interesting that its counterpart *G. grandis* has been reported as introduced at two points in Norway, around mills where seeds from Canada may have dropped (Gjaerevoll 1955).

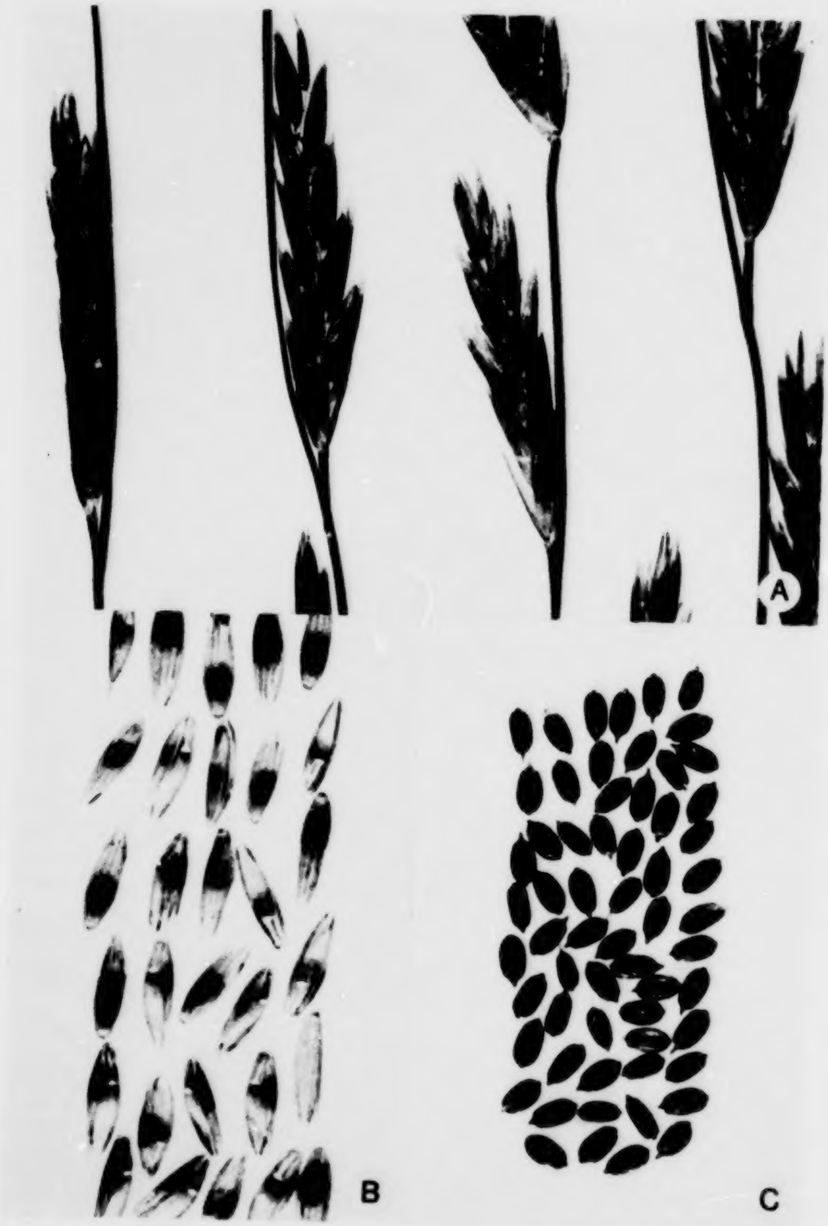


Plate 11. *A*, Spikelets of *Glyceria borealis* (Calder 9812); *B*, Florets of *G. borealis* (Dore 21441); *C*, Caryopses of *G. borealis* (Dore 21441).

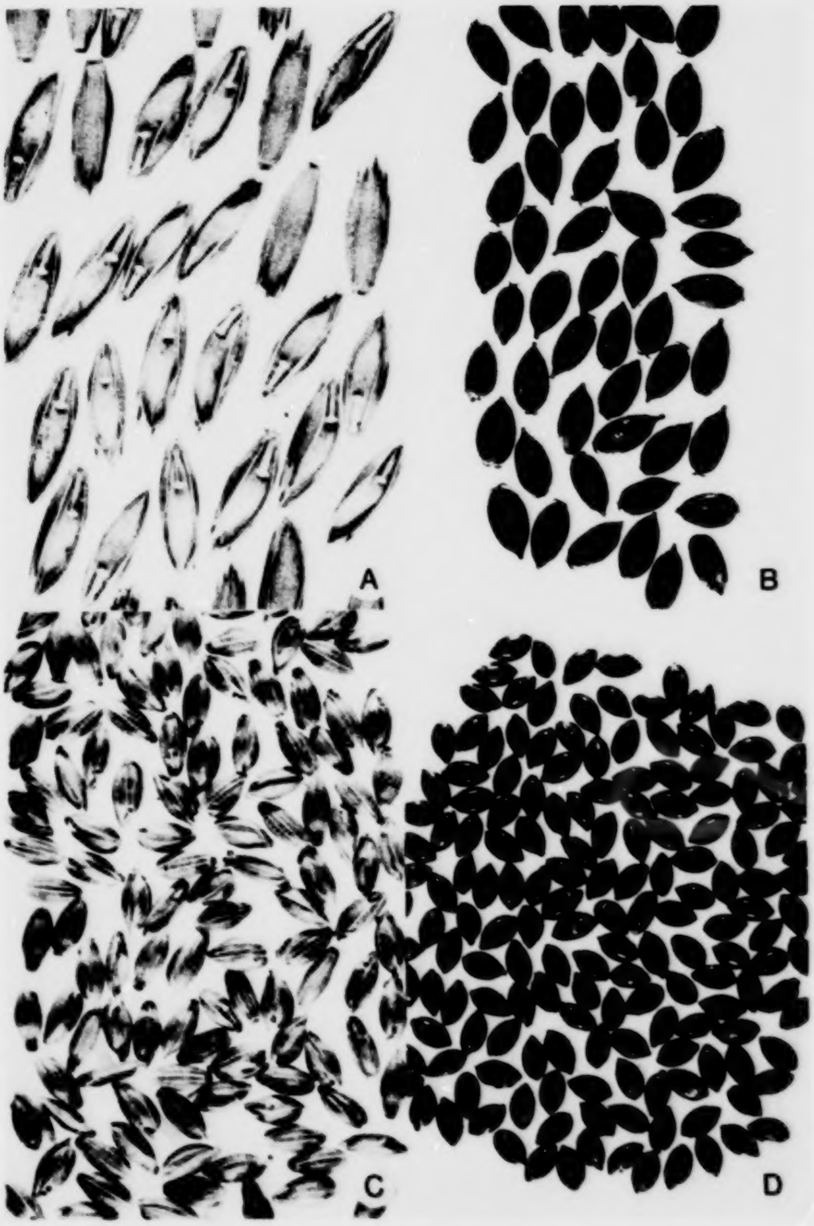


Plate 12. *A*, Florets of *Glyceria septentrionalis* (Dore and Marchant 24227); *B*, Caryopses of *G. septentrionalis* (Dore and Marchant 24227); *C*, Florets of *G. melicaria* (Dore 18438); *D*, Caryopses of *G. melicaria* (Dore 18438).

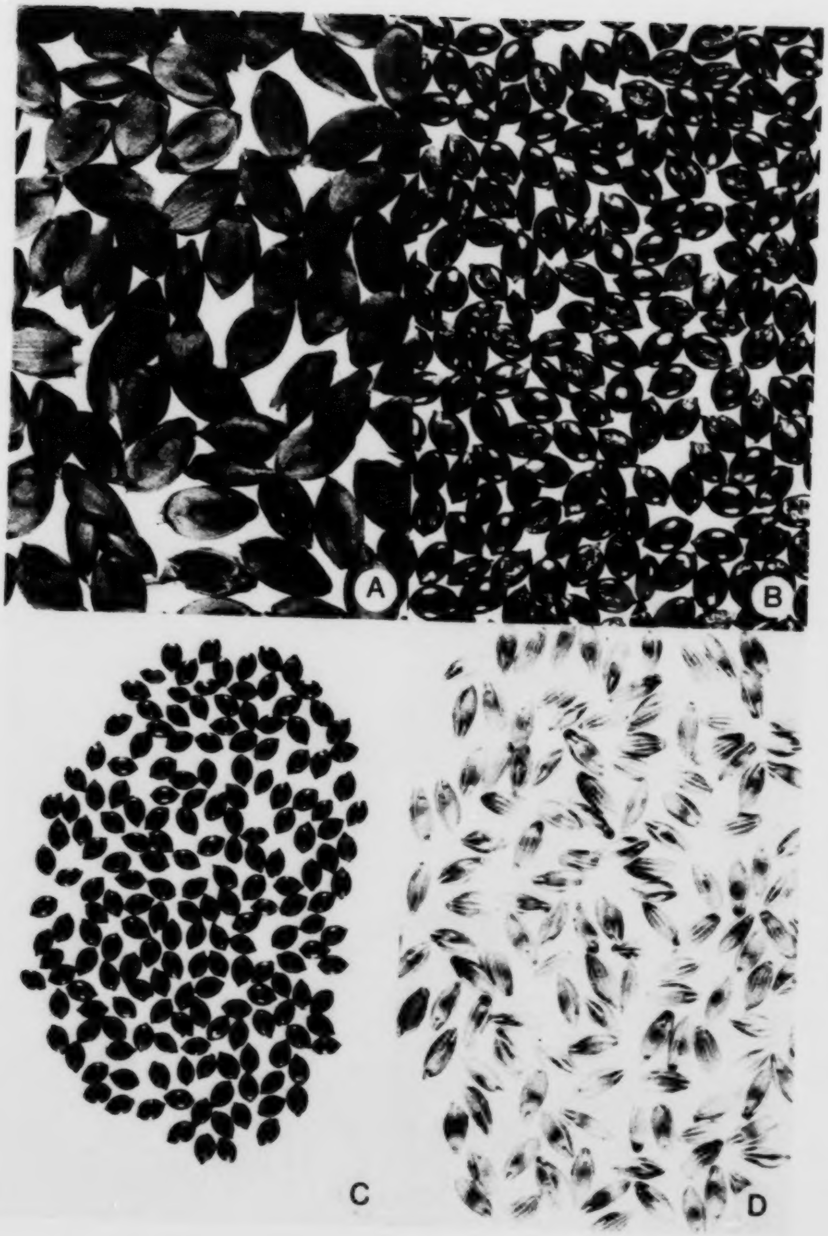


Plate 13. *A*, Florets of *Glyceria canadensis* (Dore 19812); *B*, Caryopses of *G. canadensis* (Dore 19812); *C*, Florets of *G. striata* (Dore 21138); *D*, Caryopses of *G. striata* (Dore 21138).

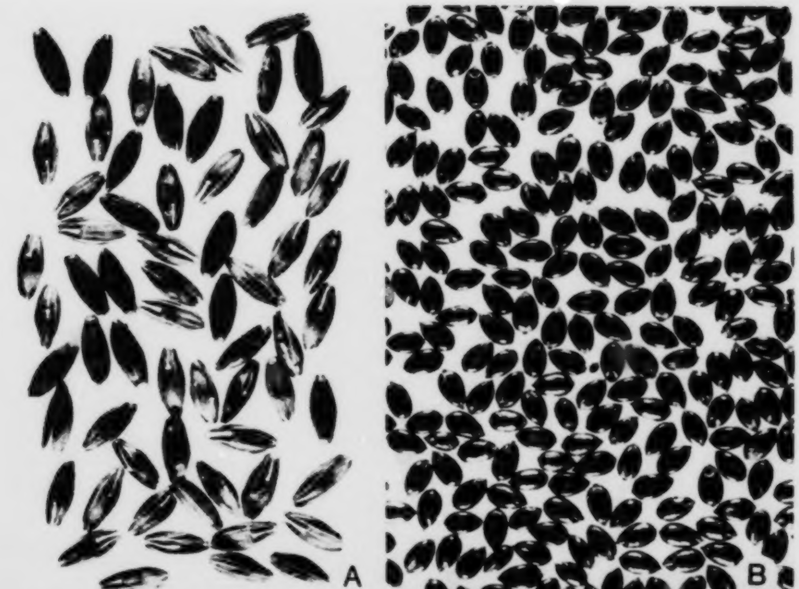


Plate 14. *A*, Florets of *Glyceria grandis* (Dore 18385); *B*, Caryopses of *G. grandis* (Dore 18385); *C*, Florets of *G. maxima* (Dore 21045); *D*, Caryopses of *G. maxima* (Calder 31984).

7. Arctophila Rupr. ex N.J. Andersson

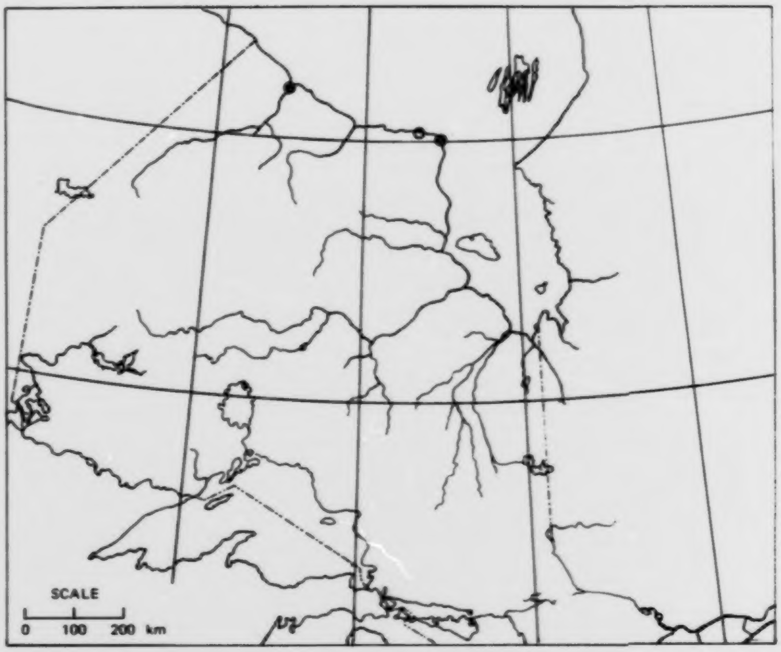
Perennial grasses with the spikelets 2- to 5-flowered, borne near the ends of slender, usually drooping or reflexed panicle branches. Glumes shorter than the lemma of the first floret; glumes and lemmas thin; lemma awnless, obtuse, with a tuft of hairs at the base.

1. *Arctophila fulva* (Trin.) N. J. Andersson (*Colpodium fulvum* (Trin.) Griseb.)

Map 50

Arctophila fulva is a rather soft-textured grass with long white rhizomes and stems that pull up readily from the water-logged soil of the tundra of the north. The leaves are flat and hairless, finely and distinctly veined, especially when dried; the ligule is long, thin-membranous, and lacerate.

The species is known in Ontario from only a few points on the Hudson Bay coast. It was collected at Fort Severn in 1940, a few kilometres below Cape Henrietta Maria in 1944, and at Sutton River in 1946 (Lepage 1966). The species has also been found at York Factory and other points on the west coast of Hudson Bay in Manitoba and northward (Porsild 1964).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Map 50. ***Arctophila fulva.***

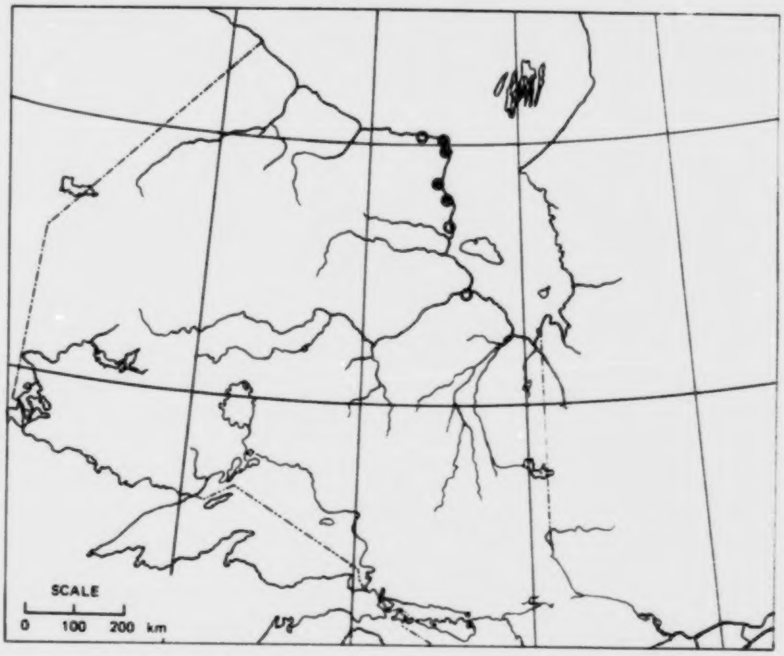
8. Dupontia R. Br.

Rhizomatous perennials with spikelets 2-flowered in a rather meagre, stiff-branched, narrow panicle. Glumes sometimes short-awned by excurrence of the midrib; glumes and lemmas very thin in texture, often frayed at end; lemmas shorter than the glumes, with a few short hairs at the base.

1. *Dupontia fisheri* R. Br.

Map 51

Dupontia fisheri, which grows to about 25 cm in height, is a grass of northern wet tundra and coastline. Along the coasts of James Bay and its islands it is an important component of the low meadow-like shores. Within Ontario it is especially abundant north of the mouth of the Attawapiskat River (Lepage 1954). All the Ontario plants are referable to subsp. *psilosantha* (Rupr.) Hultén (= var. *psilosantha* (Rupr.) Trautv.); among these are some in which the midrib of the lemma extends as a dark purple awn; these have been named forma *aristata* (Malte ex Polunin) Lepage.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Map 51. *Dupontia fisheri* subsp. *psilosantha*.

9. Poa L.

Mainly perennial grasses with hairless leaves and culms (sometimes scabrous or with microscopic hairs). Leaf sheaths closed, at least at base, the margins not overlapping. Leaf blades narrow, less than 5 mm wide, folded along the midnerve at least in the young shoots, never convolute; midnerve accentuated because of a row of "motor-cells" on either side; the other nerves generally obscure; ridges on upper surface absent; ligule membranous, short or long. Inflorescence an open or loosely contracted panicle. Spikelets 2- to 5-flowered, flattened laterally so that the glumes and lemmas are keeled along their midnerves. Glumes sharp-pointed. Lemmas always awnless, with 5 nerves, the midnerve and the 2 lateral nerves often the only distinct ones; mid and marginal nerves often villous-pubescent and in some species the internerve area appressed-pubescent; base (callus) generally bearing a long tuft of "webby" or folded hairs rising at the back (this "web" is not present in other genera).

Many of the species of this genus are notable for their variability, which has led to many ill-defined infraspecific taxa with a complex nomenclature. Some of the variation is a habitat response but much is inherited, often in association with agamospermy.

A. Spikelets proliferous, bearing vegetative buds or plantules instead of fertile florets .... 9. ***P. bulbosa***
A. Spikelets floriferous, without vegetative buds or plantules
  B. Lemmas lacking web of hairs from the callus but keel and marginal nerves pubescent
    C. Bright green sprawling annuals or winter-annuals, continually flowering, with culms often scarcely longer than the soft cross-wrinkled leaves; weeds of settled regions .... 1. ***P. annua***
    C. Dark green, blue-green, or glaucous tufted perennials with erect culms much surpassing the short, relatively firm, leaves; native plants of rocky or upland habitats in northern parts of the province
      D. Panicle pyramidal, densely spikeleted; glumes and lemmas broad (1.5–2 mm); internerve region of lemma pubescent below .... 14. ***P. alpina***
      D. Panicle with erect, sparse branches with few spikelets; glumes and lemmas narrow (0.5–1.5 mm); internerve region of lemma without any hairs
        E. Lemmas less than 3.5 mm long, ± triangular in section with a prominent keel; marginal hairs of the lemma straight, ± pectinate, more than 0.25 mm long .... 15. ***P. glauca***

E. Lemmas more than 4 mm long, ± rounded to a distinct keel; marginal hairs of the lemma curved, often overlapping, usually less than 0.25 mm long ..... 16. ***P. canbyi***

B. Lemmas, at least of the upper florets, with web of folded hairs from the basal callus

F. Plants with long rhizomes; keel and marginal nerves of lemma pubescent

G. Culm flattened laterally, 2-edged; panicle branches usually in pairs ..... 2. ***P. compressa***

G. Culm round in cross section

H. Panicle branches generally 5 at each node (at lower nodes at least); spikelets 3–∞ on each branch ..... 3. ***P. pratensis***

H. Panicle branches generally 2 at each node; spikelets usually 2–3 on each branch ..... 4. ***P. arctica***

F. Plants lacking rhizomes, usually tufted but often decumbent at base, the sprawling culms sometimes rooting; keel and marginal nerves of lemma pubescent or not

I. Ligule of lower culm leaves 2–5 mm long

J. Marginal nerves hairless but keel of lemma appressed pubescent; lemma green or purple, without bronze patch near tip ..... 5. ***P. trivialis***

J. Marginal nerves as well as keel of lemma pubescent; lemma usually bronzed toward tip

K. Culms more than 50 cm high and decumbent at base; panicle large (10–30 cm) and open, with numerous, many-spikeleted branches when well developed ..... 12. ***P. palustris***

K. Culms less than 50 cm high, slender, and erect from the base; panicle usually less than 10 cm long, its fewer branches (usually 2 or 3 from the lower nodes) few-spikeleted

L. Spikelets green; glumes with scarious, usually white, margins and green center; blades flat, flexible; plant of lax habit ..... 11. ***P. glaucantha***

L. Spikelets normally purple; glumes with little or no scarious or white margin; blades flat or conduplicate, not flexible, standing nearly erect on the culms; plant of rather stiff habit ..... 13. ***P. interior***

I. Ligule of lower culm leaves less than 2 mm long, usually less than 1 mm

M. Panicle branches 2 at each node; keel and marginal nerves of lemma hairless

N. Lemma acute, thin; ligule of lower leaves less than 0.5 mm long ..... 8. ***P. saltuensis***

N. Lemmas almost obtuse, firm; ligule of lower leaves 0.5–2.0 mm long ..... 7. ***P. languida***

M. Panicle branches more than 2 at each node; at least keel of lemma pubescent (sparsely pubescent in *P. alsodes*)

O. Marginal nerves of lemma hairless ..... 6. ***P. alsodes***

O. Marginal nerves of lemma pubescent

P. Ligule very short (0.2–0.5 mm), firm, entire but ciliolate; glumes narrow, 0.7–0.9 mm wide, distinctly white-margined, acuminate, almost bristle-tipped, the upper equalling the lowest lemma in length; panicle somewhat open at maturity, with numerous branches and spikelets; spikelets purple and somewhat yellow-tipped. Introduced plants of settled regions.................................10. ***P. nemoralis***

P. Ligule usually 1 mm long or slightly longer (up to 2 mm), thin, minutely toothed and ciliolate; glumes 0.9–1.2 mm wide, short-acuminate to acute, the upper rarely equalling the lowest lemma; panicle open or contracted at maturity, the basal branches mostly 2 or 3 at a node. Native plants of rocky or elevated places

  Q. Spikelets green, rarely with a tinge of purple; glumes with a wide, scarious (usually white) margin and green center, acute, the lateral nerves evident; habit lax; leaf blades flat and flexible; sheath not keeled....11. ***P. glaucantha***

  Q. Spikelets usually purple; glumes with little or no white margin, acuminate, the lateral nerves indistinct; habit rather stiff; leaf blades flat or conduplicate, not flexible; sheaths keeled.......... ....13. ***P. interior***

1. *Poa annua* L.

Fig. 6, Plate 15, Map 52

annual blue grass, low spear grass

Poa annua has become a common weed grass of gardens, well-packed roadsides and walks, lawns, and waste places throughout the settled portion of the province. It is common also in the Clay Belt (Baldwin 1958) and around some of the settlements farther north (Dutilly and Lepage 1963). The early plant lists dismiss it as "common" or "very abundant," and therefore it was seldom collected for preservation.

Although they have the appearance of a weak-rooted annual, the plants do not always die after the seeds ripen, but if conditions are not arid, they may continue to flower and fruit continuously as a perennial. The plants are usually killed by a prolonged summer drought, but seeds dropped on the soil germinate quickly when moist weather returns. Green stems persist through the winter and flower early in the spring, earlier than any other grass, particularly when located next to heated buildings or underground conduits. Certain nonflowering strains from Europe when transferred to Ottawa persisted vegetatively for years in outdoor cultivation as perennials; such strains are not yet represented in the Canadian populations. A more descriptive name than annual blue grass is desirable since the plant is not truly an annual, as *Digitaria* is, for example, and the foliage is a distinctly yellow-green.

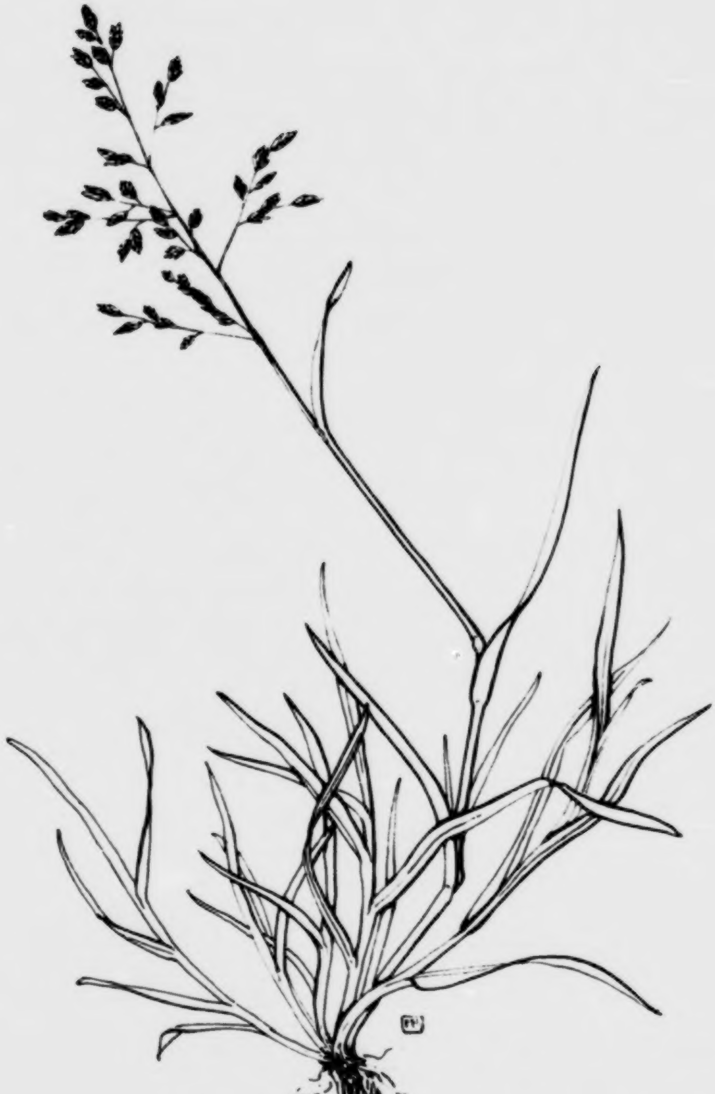
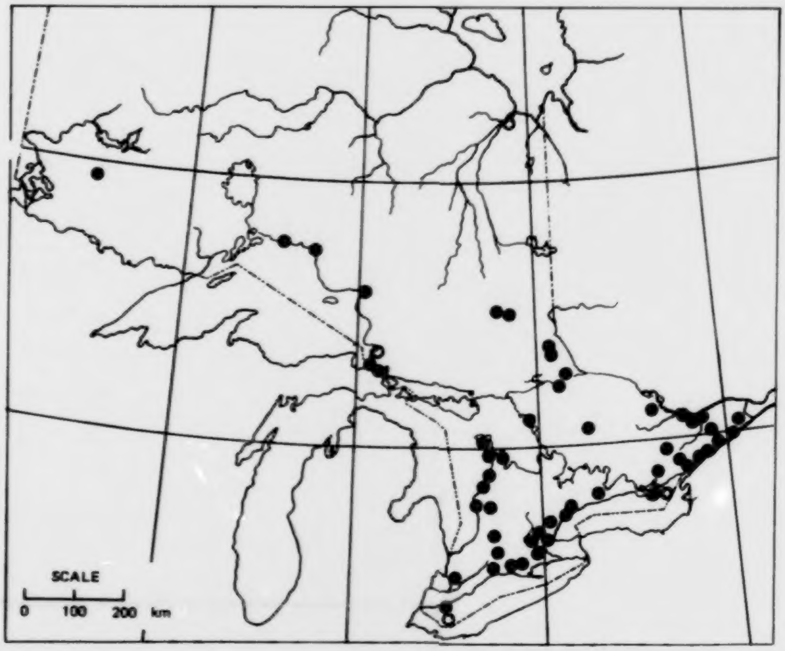


Fig. 6. *Poa annua* L.

Poa annua is of little value as forage, mainly because the plants pull up from the soil and are thus disagreeable to cattle. In pastures, the grass is often abundant, particularly in winter-killed patches where the sod-forming herbage is thin. In home lawns its pale panicles make an unattractive appearance and are not easily removed by the mower. On the other hand, *Poa annua* often supplies the only greenery on moist paths in parks, along city streets, and across lot corners where other species have been destroyed by trampling and perennials killed or retarded by winter applications of salt. These green swards have attracted the admiration of lawn keepers, but when samples are given good soil the ordinary straggly type of plant results. In the close cut and carefully tended fine turf of golf and bowling greens, *Poa annua* also thrives and cannot easily be eradicated, because panicles will mature in plants kept clipped at 0.5 cm. The general biology of the species is reviewed by Wells (1974).



Map 52. *Poa annua*.

2. *Poa compressa* L.

Fig 7, Plate 15, Map 53

Canada blue grass, wire grass

Poa compressa is a very common and widespread introduced species in all of southern Ontario. It is abundant and usually the sole grass on shallow soil on limestone pavements, on thin soil around granite outcrops, on exposed roadside embankments subject to erosion, on sandy beaches, in arid, but not in wet, sandy fields, and on heavy clay soils subject to baking in the summer. It appears also to have spread northward to Cochrane District and westward beyond Lake Superior where it is present along roadsides and railroads and wherever there are settlements; here it invades sandy fields, and even the adjacent jack pine (*Pinus banksiana)* forest land. The species was not, however, collected in surveys in the 1930s along the north shore of Lake Superior. The localities along Moose River (Cochrane Distr.) are introductions on the railroad grades, and that at Winisk is at the settlement, according to Dutilly and Lepage (1963) and Lepage (1966). In the northern half of the province, therefore, it is quite obvious that *P. compressa* is a recently arrived alien, but the discovery of plants in natural wilderness in the south can lead to difference of opinion on origin. Seeds in viable condition are found in cattle manure and so presumably are carried widely by deer. Records of a century ago indicate that *P. compressa* was abundant around the centres of settlement, then concentrated between Montreal and Sarnia; none of the older specimens come from the wild habitats in which the species is found today.

Although an Old World species, Canada blue grass got its now well accepted common name several decades ago, about the time that Ontario and southern Quebec became synonymous with the term "Canada," and a contrasting name to Kentucky blue grass was desired; before that it was known as wire grass (when wire came into use as a general commodity), and before that English blue grass. In Britain, where the grass is native but has never gained the density and importance that it has in southern Ontario, it has no genuine common name, only the English translation "flattened meadow grass".

P. compressa is readily recognized by its long clean rhizomes, flattened stems with conspicuous nodes, and short, glaucous, or purple-tinged leaves. The culms remain green long after maturity even while the sheaths of their leaves turn almost white by drying and bleaching. In woodland or heavily shaded locations, plants grow lanky; their rhizomes appear like surface stems buried by loose leaf mold, and their panicles are reduced to a few spikelets of only one or two florets. These shade plants are difficult to identify and so tend to be overrepresented in herbaria. They may resemble *P. nemoralis*, distinguishable by its minute rachilla hairs, and they have even been confused with shade forms of *Agrostis gigantea* and *P. palustris*.

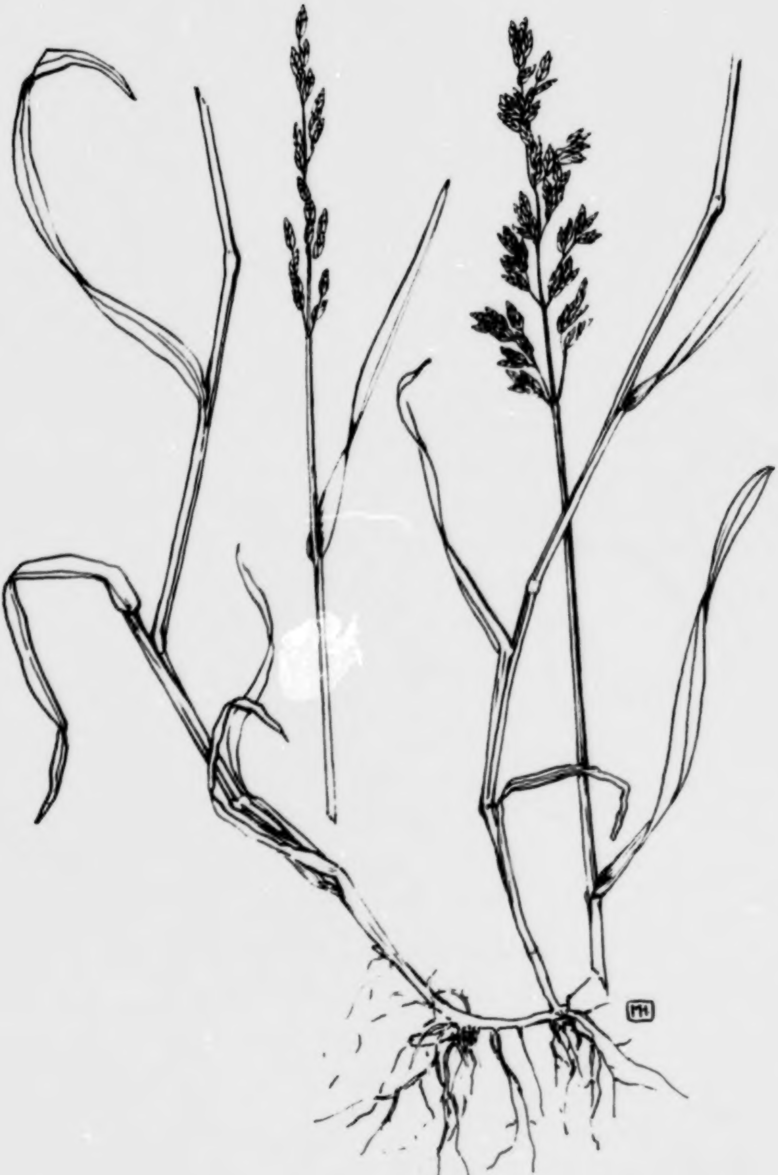
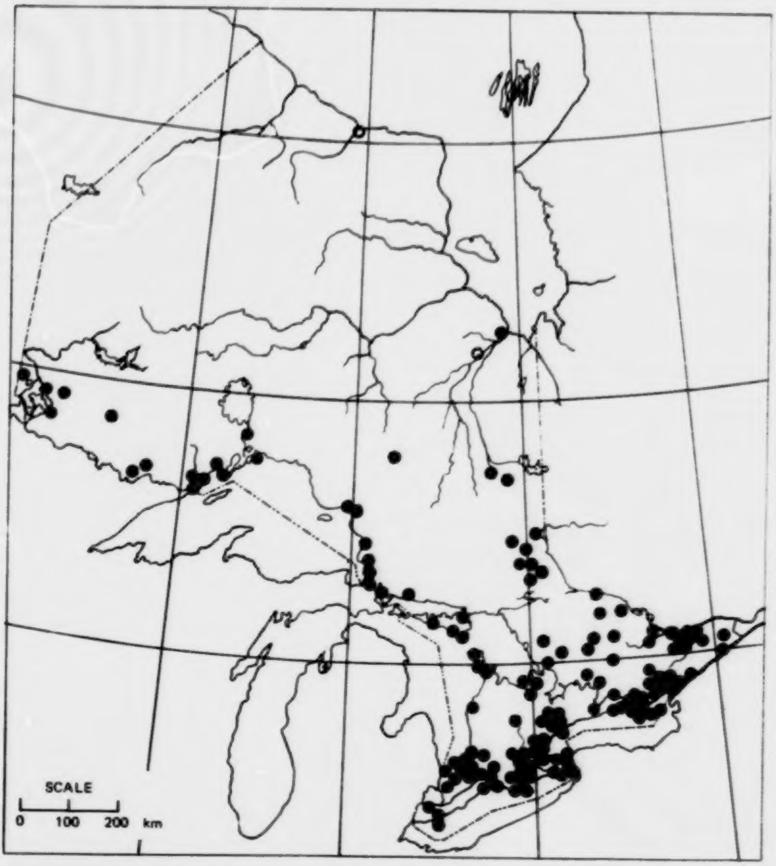


Fig. 7. *Poa compressa* L.

When transplanted to open ground, these etiolated shade plants grow into normal sturdy clones with shorter stems and dense panicles of many-floreted spikelets. *P. compressa* seems to be remarkably uniform genetically, its great phenotypic variation being a direct response to habitat conditions.

A valuable forage grass despite the sparse wiry appearance of its stands, *P. compressa* is the dominant grass in pastures on the clay plains of southwestern Ontario and the shallow limestone soils of Manitoulin Island. Canada blue grass can easily withstand moderate grazing, it survives the midsummer drought and winter frost-heaving to which its soils are subject, and in this respect is rather unusual among our grass species. It is not suitable, however, for lawn turf because of the stubbly appearance that it creates.



Map 53. *Poa compressa.*

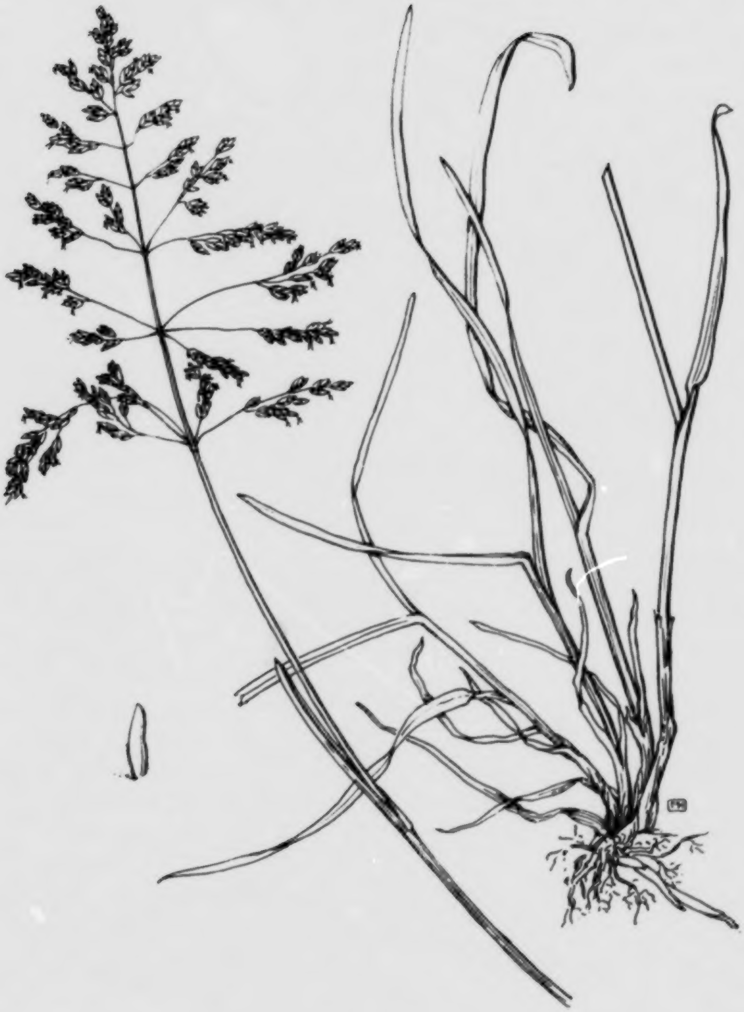


Fig. 8. *Poa pratensis* L.

3. *Poa pratensis* L.

Fig. 8, Plates 15 and 16, Maps 54 and 55

June grass, Kentucky blue grass, spear grass

Probably the most abundant grass throughout the world, *Poa pratensis* is thought to be a native of north temperate Europe and Asia, but has spread widely to all parts of Canada. In Ontario it is represented by two races treated here as varieties but often considered to be separate species. One of these, var. *alpigena*, is restricted to the northern coast, whereas the typical variety is widespread.

Culms 30–100 cm high; spikelets 3- to 5-flowered, up to 5 mm long..a. var. ***pratensis***
Culms 20–30 cm high; spikelets 2- to 3-flowered, up to 7 mm long....b. var. ***alpigena***

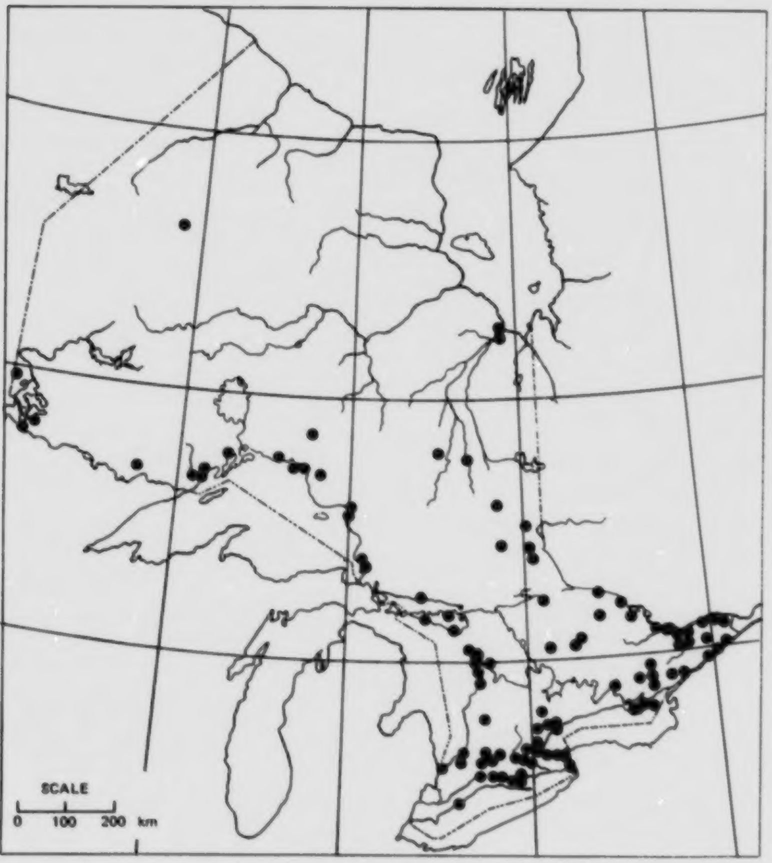
3a. var. *pratensis*

The typical variety of *P. pratensis* occurs throughout the province but is particularly abundant in southern Ontario. It readily dominates lawns and pastures when these are regularly mowed or grazed. It is found on most roadsides, embankments, and parks where its cover is desirable, but it also spreads into gardens either by seeds or by runners and becomes a weed, especially among ornamental perennials. It is sometimes the only grass species to survive in disused sandy hayfields and is commonly known as June grass. It is still not present in the more inaccessible sites within the boreal forest area, but wherever man has made a clearing, a road for lumbering, or a path for portaging, *P. pratensis* is found. The species varies according to whether the habitat is dry, wet, or shaded, but in every case it spreads by rhizomes to form solid patches. *P. compressa* is the only other rhizomatous *Poa* in Ontario.

A narrow-leaved variant named *P. angustifolia* L. or *P. pratensis* var. *angustifolia* (L.) Wahlenb. is prevalent in Europe, and in Ontario many ordinary plants growing in dry sites or in moist shade are confused with it. When transplanted to a rich soil in the open, these Ontario plants develop the broader flat leaves of typical *P. pratensis*. Reputably native populations in Manitoba have been made the basis of a new species, *P. agassizensis* Boivin & D. Löve, which has also been recorded in Ontario. We include these plants within our broad concept of *P. pratensis*.

Low plants of Kentucky blue grass with enlarged, many-nerved and usually hairless florets are sometimes present along moist paths. These plants, which are difficult to identify, have their ovaries infested with a nematode, *Anguina agrostis*. So far, these parasitized plants have been found only near the shores of the St. Lawrence River system, at Toronto Island, Georgina Island, Rockport, Mallorytown, and the Long Sault Rapids.

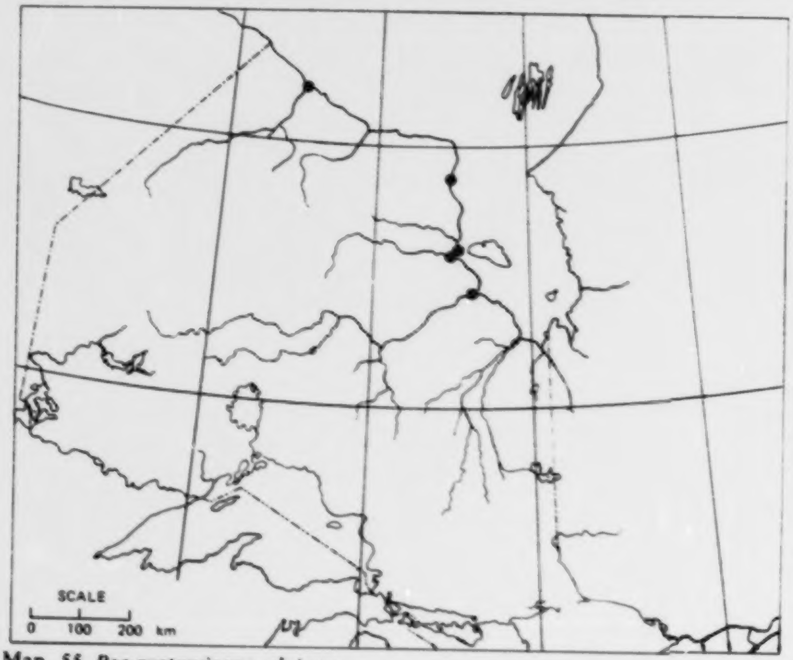
The cultivar 'Merion' is the most notable of the several races selected for turf purposes. The strain was first noticed in a golf course in Pennsylvania and is now the chief one used in Ontario for lawn purposes. Its outstanding features are its larger florets, broader deep green blades, vigorous sod-forming habit, and susceptibility to mildew, all inherited consistently through the seed, which is produced asexually (agamospermy). Agamospermy is also widespread in wild populations.



Map 54. *Poa pratensis* var. *pratensis*.

3b. var. *alpigena* Fries (*P. alpigena* (Fries) Lindman)

The variety *alpigena* occurs as a native in the moist tundra of the north and several specimens have been gathered along the coastal meadows, shores, and beach ridges of Hudson and James bays in Ontario. Its features of lower stature, larger spikelets, sparse pyramidal panicle, and short thick blades distinguish it from the typical race of Kentucky blue grass.



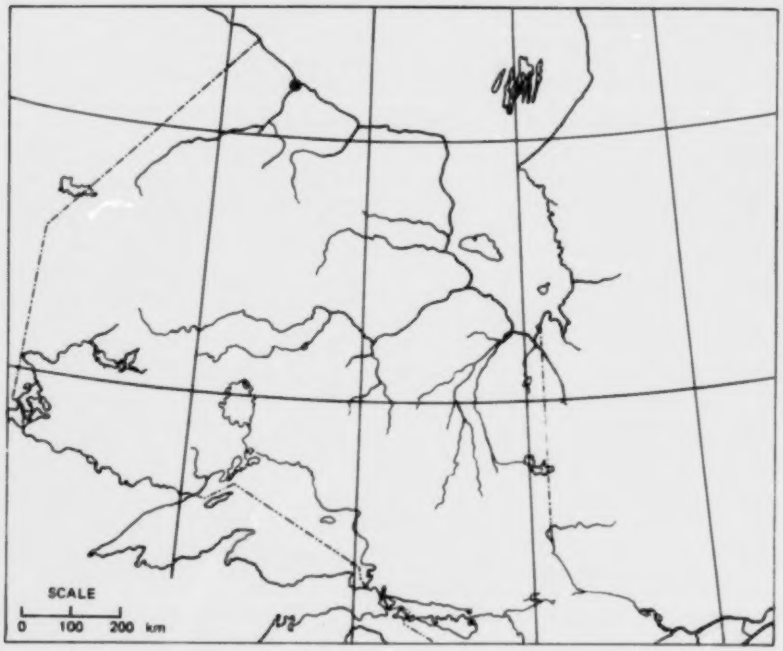
Map 55. *Poa pratensis* var. *alpigena*

4. *Poa arctica* R. Br.

Map 56

arctic blue grass, arctic poa

Poa arctica is a characteristic arctic grass known in Ontario only on the grassy area along Hudson Bay at Fort Severn. The plants from that locality are referable to the subsp. *arctica*, which has an extensive circumpolar distribution. *Poa arctica* is distinguishable from *P. pratensis* var. *alpigena* by its more open panicle with spreading branches that bear only 2 or 3 spikelets.



Map 56. *Poa arctica* subsp. *arctica*.

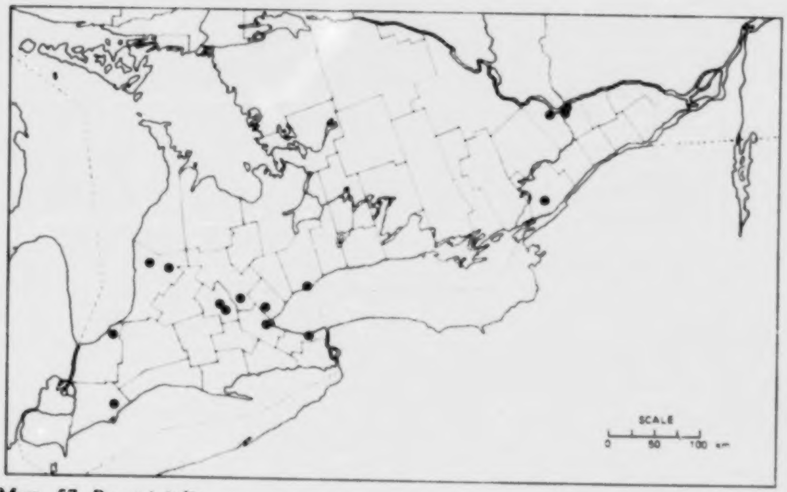
5. *Poa trivialis* L.

Plate 16, Map 57

rough-stalked meadow grass, rough blue grass

An introduced perennial, *Poa trivialis* is frequently included in pasture and lawn grass seedings and succeeds in some carefully tended greens or in moist shaded places such as ditches and around drain pipes. It is not, however, widely naturalized in Ontario as it is in the coastal climates of the Maritimes and British Columbia.

The foliage is an overall yellowish green, somewhat shiny, with the sheaths often pink or purple tinged. Upper sheaths and culms are generally distinctly scabrous, somewhat rough to the touch, unlike most of our other species of *Poa*. The panicle is rather densely flowered, but in shaded sites, where it occurs rarely, the weakened plants produce much reduced panicles of only 2-flowered spikelets. The whitish margin of the glumes is often distinctive, as is the long ligule, 2 to 6 mm, which is white, entire-margined, and acute.



Map 57. *Poa trivialis.*

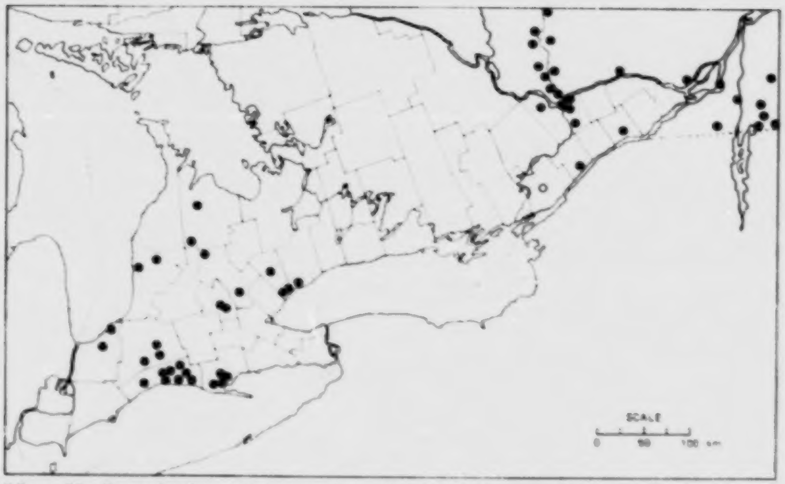
6. *Poa alsodes* A. Gray

Plate 16, Map 58

woodland poa

Poa alsodes is a native perennial of rich deciduous woods, forming loose clumps with culms greatly exceeding the foliage. It flowers early, in late May and June, and the panicles become ripe in early June bearing horizontally spreading or slightly reflexed branches. The whole plant is generally a light green color. Branches of the panicle are usually in whorls of 5, at distant nodes. The spikelets are few in number, borne toward the ends of the branches. The callus of the lemma is provided with folded hairs that are unusually long and fine, tending to entangle the shed fruits like a cobweb.

P. alsodes is a rather rare species, distributed in two separate sections of the province and neighboring Quebec. It is found through the eastern counties extending into southwestern Quebec and northward up the Gatineau Valley in western Quebec for about 160 km. It also occurs in most of the southwestern counties, although apparently absent from such well-collected areas as the Niagara Peninsula, Essex and Kent counties, and the Bruce Peninsula. The factors determining the distribution of *P. alsodes* would be interesting to investigate, especially because its seeds seem sometimes to be dispersed by woodland mammals, to which they adhere by means of the silky lemma hairs, a rather unusual feature among grasses.



Map 58. *Poa alsodes*. All known Canadian records from the area covered by the map are plotted.

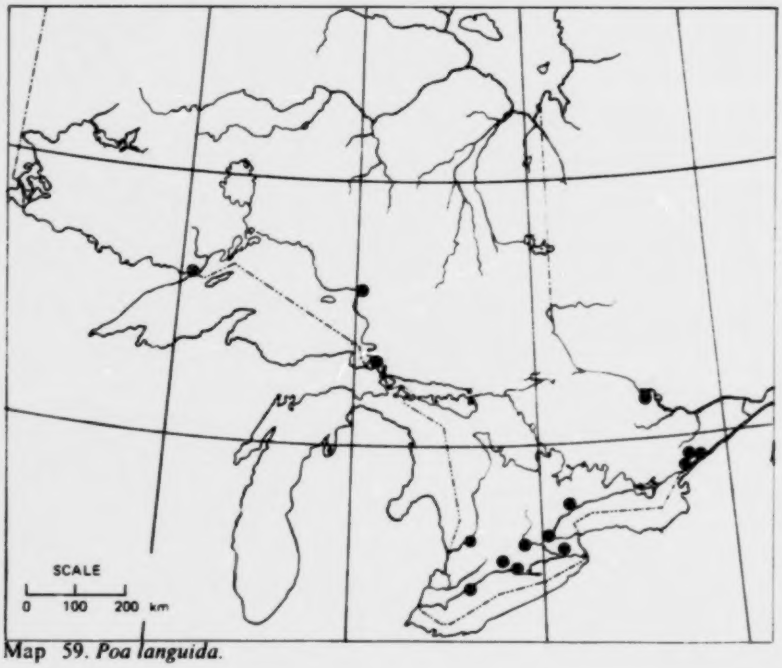
7. *Poa languida* A. S. Hitchc.

Plate 17, Map 59

languid poa

A native perennial of open dry woods, *P. languida* is usually noted by its tufted habit and drooping panicles similar to *P. saltuensis*. The few spikelets usually have only two florets near their tips on clavate pedicels. The lemmas are hairless except for the sparse web at the callus, minutely papillose (best seen when dry) with the keel incurved to the blunt tip.

The species is rare and found mainly in southwestern Ontario (e.g., at Grand Bend, Huron County; Rondeau, Chatham County; St. Thomas; Clear Creek, Haldimand-Norfolk Region; St. Clements, Waterloo County; Port Davidson, Niagara Region; Hamilton; and Ballantrae, York County), at the east end of Lake Ontario (Kingston; Ivy Lea and Charleston, Leeds County), and in the Lake Superior area (near Sault Ste. Marie), and at Michipicoten, Algoma District; and Pigeon River, Thunder Bay District. It is difficult to distinguish in the field, and no specimens appear to have been collected before 1936.



Map 59. *Poa languida*.

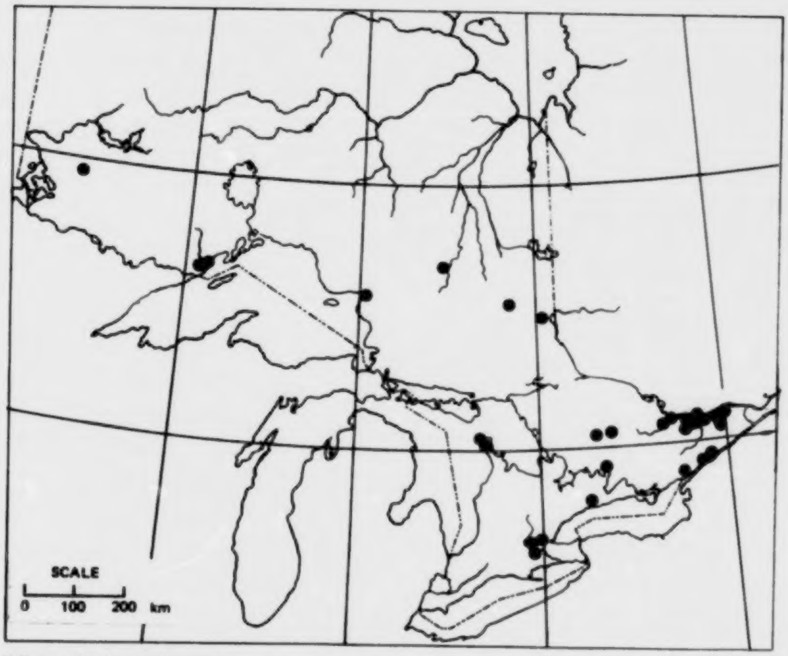
8. *Poa saltuensis* Fernald & Wieg.

Plate 17, Map 60

two-rayed poa

A native perennial of open woods, *Poa saltuensis* has panicles with 2 branches at each node, usually arched under the weight of the spikelets near their ends. The lemmas are softer and more sharply pointed than in *P. languida* and not as curved and hooded at the tip. The lower leaf sheaths are usually purplish.

P. saltuensis is rather rare in Ontario as it is elsewhere in its wide range eastward to Newfoundland, becoming locally abundant when woodland is opened up by clearing. Its distribution is scattered through the Ottawa Valley, Algonquin Park, the Upper St. Lawrence Valley, in Waterloo and southern Wellington counties, the Bruce Peninsula, around Lake Superior, and across the Clay Belt. Among specimens from the Clay Belt are some that are referable to var. *microlepis* Fernald & Wieg., said to be distinguished from var. *saltuensis* by its smaller lemmas. The distribution and variability of *P. saltuensis* and its relationship to *P. languida* are not well understood.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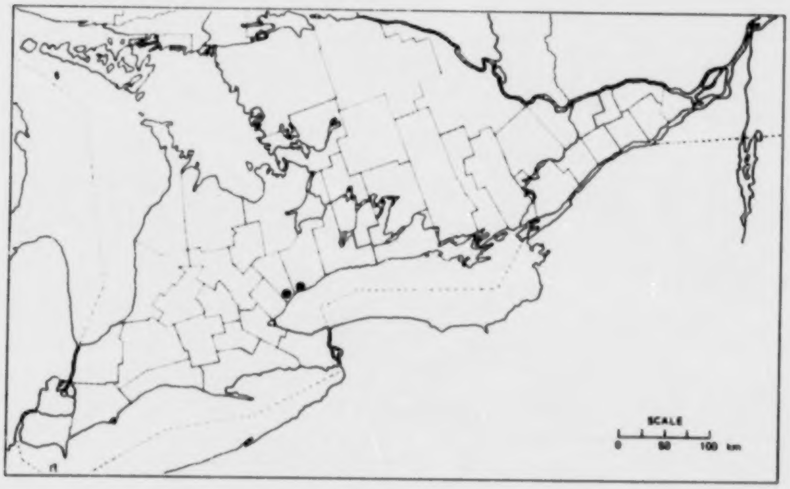
Map 60. *Poa saltuensis.*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Map 61. *Poa bulbosa.*

9. *Poa bulbosa* L.

Map 61

blue grass, bulbous poa

Introduced from Eurasia, *Poa bulbosa* has long been known in lawns, fields, and meadows in various parts of the United States, and in coastal British Columbia in Canada. Recently the species has also been found in Ontario in a number of localities in the Toronto area (Catling et al. 1978).

Although the species often produces 3- to 6-flowered fertile florets in Europe, most North American plants are proliferous, producing bulblets or plantules within the glumes of each spikelet. This variant has been called *P. bulbosa* var. *vivipara* Koeler.

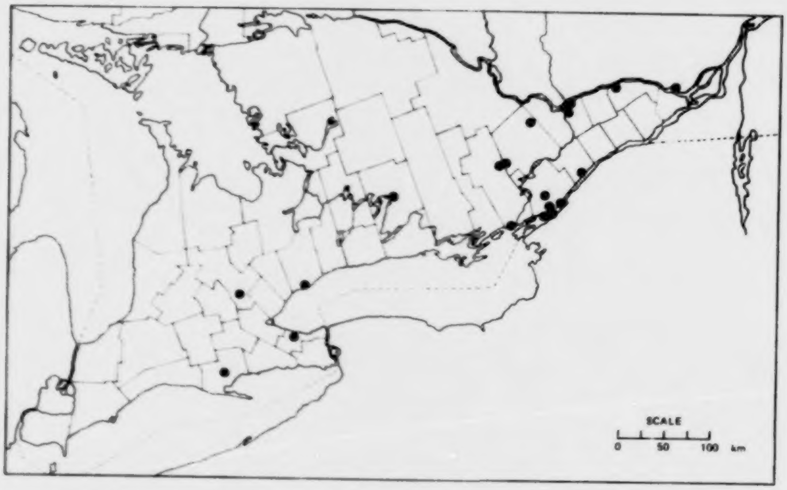
10. *Poa nemoralis* L.

Plate 17, Map 62

wood blue grass

Poa nemoralis is a sparsely introduced species found mainly in long-settled towns and old resort areas where at one time it was recommended to seed lawns in shady areas. It does not survive mowing, but it has escaped to survive in adjoining woodland where its slender stems, short spreading blades, and clumped habit of growth make it readily distinguishable from any native species. Both green and glaucous variants exist depending on the original type introduced. Examples of such establishment in the province include: ledges in woodland at Rockcliffe Park, Parliament Hill, and Hog's Back in the city of Ottawa; several localities in the Prescott, Thousand Islands, and Kingston areas; on Catherine Parr Traill's island in Stony Lake north of Peterborough; and at Toronto, Grimsby, Guelph, and Simcoe.

The published records for Wellington County (Stroud 1941), Toronto vicinity (Scott 1913), the Bruce Peninsula (Stebbins 1935), Batchawana Bay (Taylor 1935), and the James Bay region (Potter 1934) have been disregarded because most seem to refer to native members of the *P. palustris-interior-glauca-glaucantha* complex, which have been confused with the Old World *P. nemoralis* by several authors.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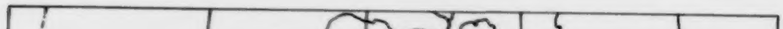
Map 62. *Poa nemoralis.*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Map 63. *Poa glaucantha.*

11. *Poa glaucantha* Gaudin

Map 63

Poa glaucantha is a poorly understood native species that has been variously treated taxonomically, but is obviously related to *P. glauca* and *P. palustris* and may have evolved through past hybridization between them. It has been found at rather isolated and disconnected stations from Nova Scotia to Minnesota, always on rock ledges or talus piles of various composition, such as limestone, granite, gneiss, or basalt, and near the shores of large rivers and lakes. These exposed rocky sites are similar to the ones occupied farther north by *P. glauca* but lie within the geographical range of *P. palustris*.

The chromosomes of a plant of this species from the cliff talus at the mouth of Jones Creek near Mallorytown, Leeds County, have been counted as $2n = 42$ (Bowden 1961, as *P. interior*). *P. palustris* has generally $2n = 28$ and *P. glauca* varies from $2n = 42$ to $2n = 70$ or even higher. The somatic number 42 is the same as that reported for *P. stenantha* Trin., a western species with which *P. glaucantha* has sometimes been linked.

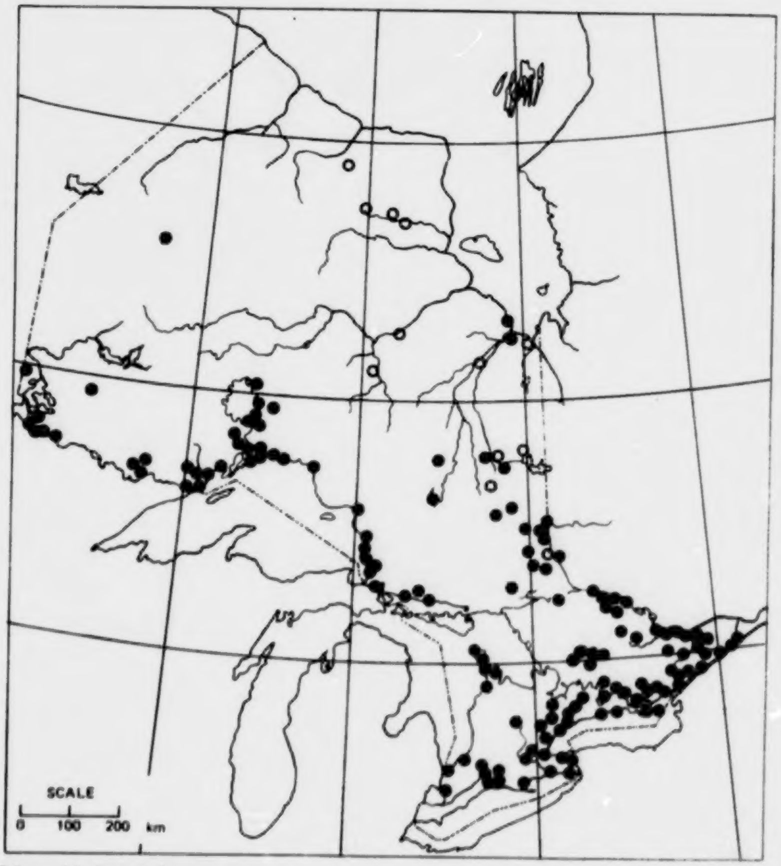
Butters and Abbe (1947) gave much consideration to members of this difficult complex in the Lake Superior area of Minnesota and treated the plants that we refer to this species as *P. glauca* subsp. *glaucantha* (Gaudin) Lindman. There is, however, some doubt as to whether the populations known under the epithet *glaucantha* in North America belong to the same taxon as the plants from the mountains of central Europe, on which the name is based.

12. Poa palustris L.

Plate 17, Map 64

fowl blue grass, fowl meadow grass, swamp blue grass

Poa palustris is a widespread and usually abundant native species common throughout much of the province, although no specimens are known from several of the southwestern counties, the Parry Sound District, Manitoulin Island, or from the greater part of the coast along Hudson and James bays. A very plastic species, *P. palustris*, both in northern Europe and in Canada, exhibits great variation in response to habitat and presents considerable difficulty in identification. As a result many specimens have been identified and literature records made under a variety of specific names. The grass is unusual in its continuous flowering from late June to the end of the season, with the fullest panicles and best-filled spikelets appearing in mid-July, and in the variety of habitats in which it grows, from dry rocks to shorelines and sheltered woods. The best development seems to be in riverbank meadows. Under Ontario conditions it volunteers readily when land is cleared and can form a substantial proportion of the hay crop, especially on moist soil.



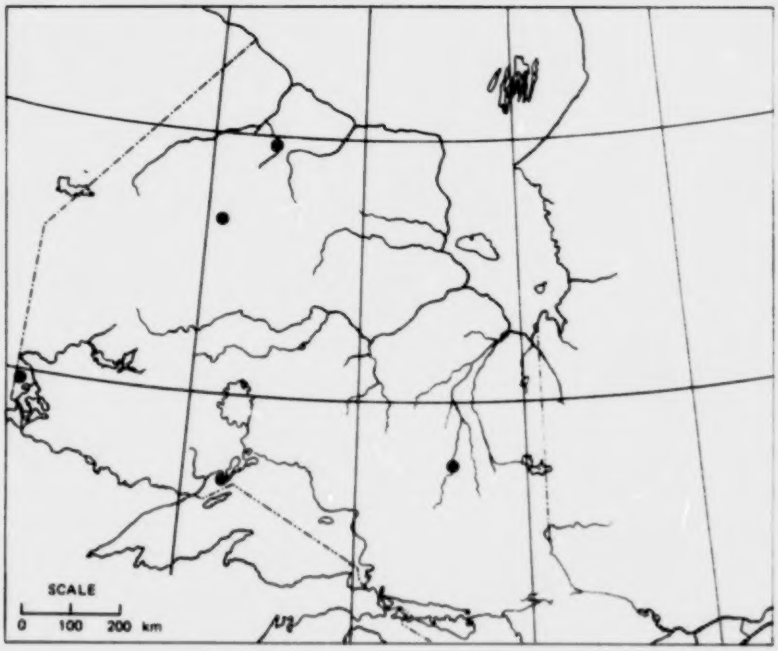
Map 64. *Poa palustris.*

13. *Poa interior* Rydb.

Map 65

interior poa

Poa interior is closely related to *P. palustris* but is smaller, more upright in growth, and flowers only once in the season. The shorter ligule is scabrous and the culm is rough below the panicle. It is an abundant species in the western prairies and is scattered eastward into Ontario on exposed or eroded sites. Butters and Abbe (1947) combine it with *P. nemoralis* as var. *interior* (Rydb.) Butters & Abbe, but its relationship is clearly with *P. palustris*.



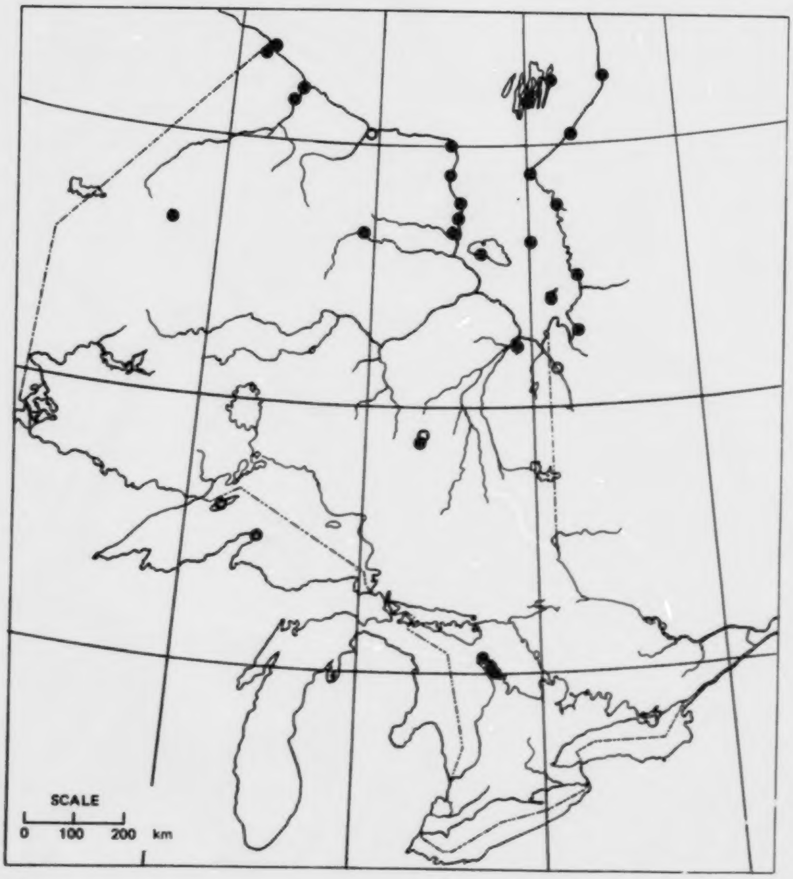
Map 65. *Poa interior.*

14. *Poa alpina* L.

Plate 18, Map 66

alpine blue grass

Poa alpina is a caespitose low-growing species distinctive in its thick stems of whitish basal sheaths partly buried in the soil. It is widespread in subarctic regions of Canada, but in Ontario it is mainly confined to coastal areas along James and Hudson bays where it occurs on the shore deposits of inflowing rivers. It is also, however, known far inland on the Severn, Attawapiskat, and Missinaibi rivers. Flowerpot Island, off the tip of the Bruce Peninsula, where the grass was discovered in 1933, was once considered to be its southernmost station in eastern North America (Stebbins 1935). It has been found since then, however, clinging to other dolomitic cliffs on the peninsula. It is also reported from Isle Royale and Keewenaw Point on the Michigan side of Lake Superior, but has not been found in other well-explored sites along the lake.



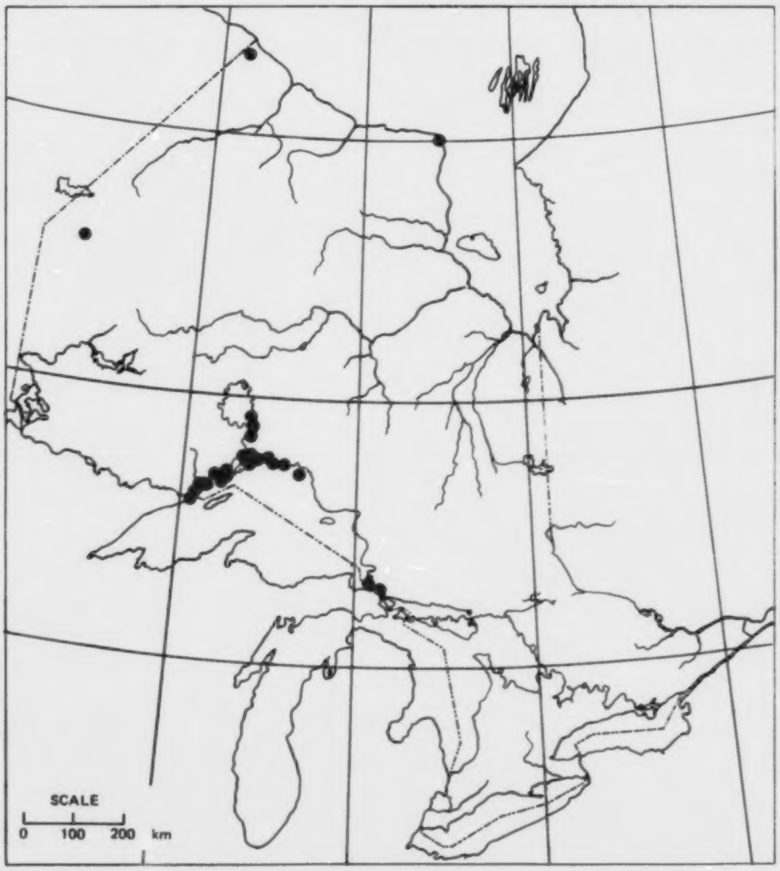
Map 66. *Poa alpina.*

15. *Poa glauca* Vahl

Plate 18, Map 67

glaucous poa

Poa glauca is widespread across the north of the continent, but it is largely restricted in Ontario to localities within the climatic influence of Lake Superior and Lake Nipigon where it occurs on shallow soil over rock, in crevices, and on cliff ledges. Where it is found, it is generally abundant and almost the only vegetation on exposed talus slopes. It blooms very early in the season and the wire-like terete culms remain erect throughout the winter. It is also known from a few other localities to the north, mainly on sandy riverbanks or shores. Most reports from other parts of the province



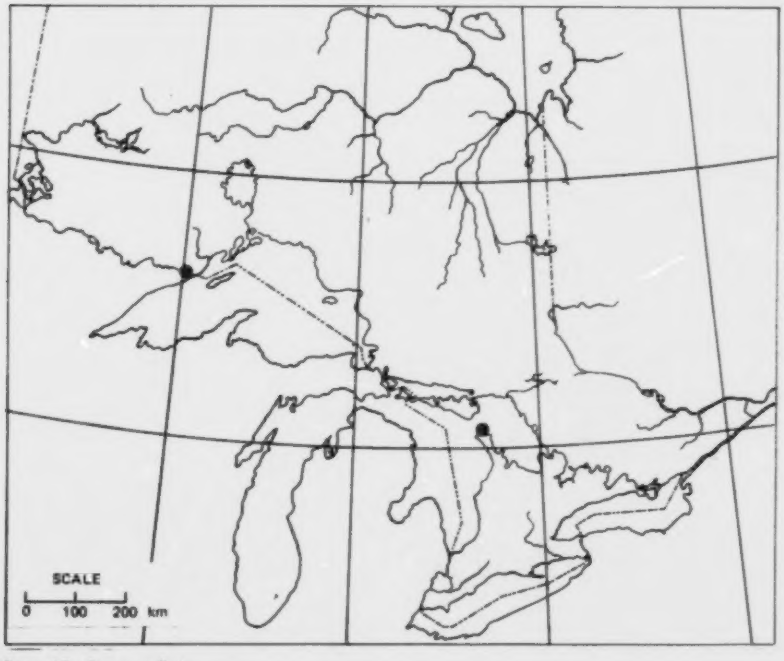
Map 67. *Poa glauca.*

refer to other species and have been disregarded, but the delimitation of the species is not clear, and specimens are known from eastern Ontario that may be best referred to it.

16. *Poa canbyi* (Scribner) Howell

Map 68

A widespread species in the Prairie Provinces characterized by its rounded glumes and lemmas, *Poa canbyi* has long been known from an isolated locality on Isle Royale, Michigan. It was first discovered in Ontario in 1975 by J. K. Morton at three separate places, Flowerpot and Bears Rump islands in Georgian Bay, and near the Minnesota border at Pigeon River, Thunder Bay District. Specimens from the Pigeon River locality are laxer in habit than is usual in *P. canbyi* and resemble *P. glauca*. The spikelets and florets are, however, considerably longer than usually observed in *P. glauca*.



Map 68. *Poa canbyi*

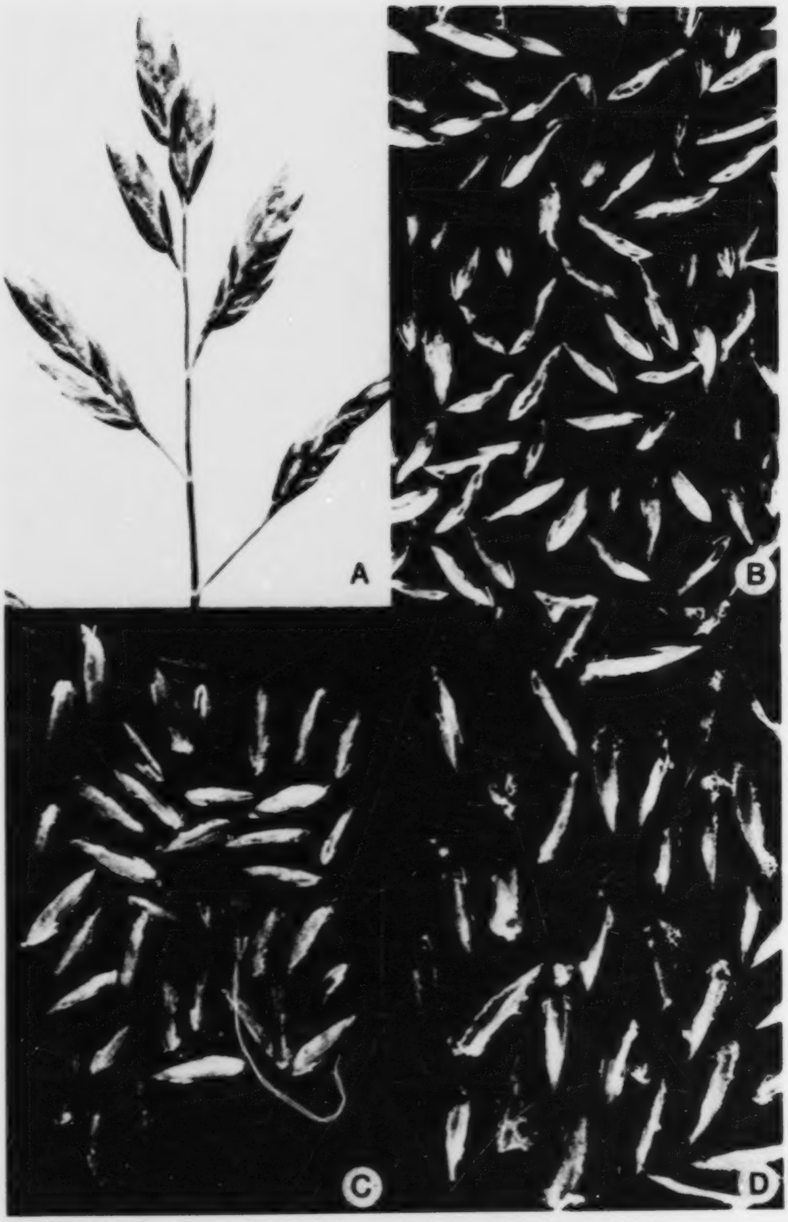


Plate 15. *A*, Spikelets of *Poa annua* (Dore in 1969); *B*, Florets of *P. annua* (Dore in 1969); *C*, Florets of *P. compressa* (Dore 21068); *D*, Florets of *P. pratensis* var. *pratensis* (Dore and Marchant 24007).

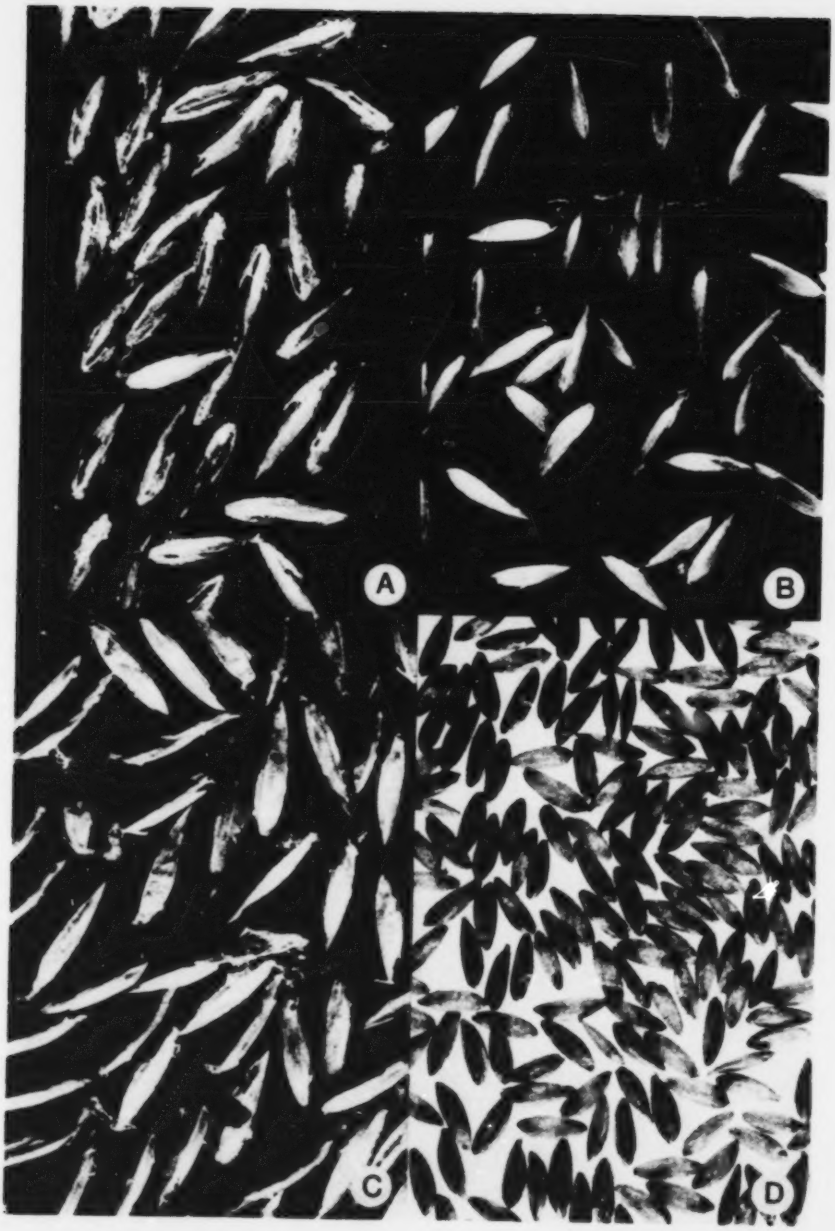


Plate 16. *A*, Florets of *Poa pratensis* var. *alpigena* (Dutilly and Lepage 16639); *B*, Florets of *P. trivialis* (Dore 46-11); *C*, Florets of *P. alsodes* (Dore 22167); *D*, Caryopses of *P. alsodes* (Dore 22167).

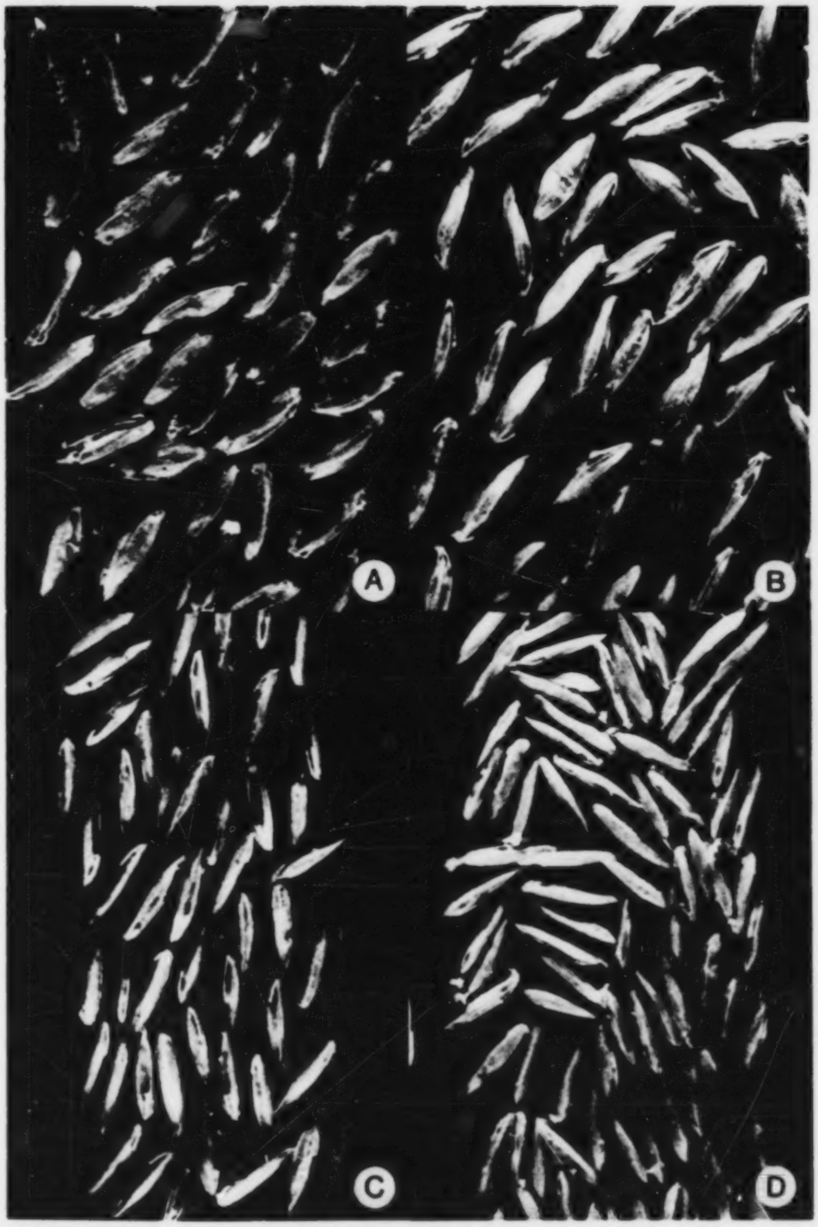


Plate 17. *A*, Florets of *Poa languida* (Dore 22186); *B*, Florets of *P. saltuensis*; *C*, Florets of *P. nemoralis* (Dore 21279); *D*, Florets of *P. palustris* (Dore and Brayshaw 21652).

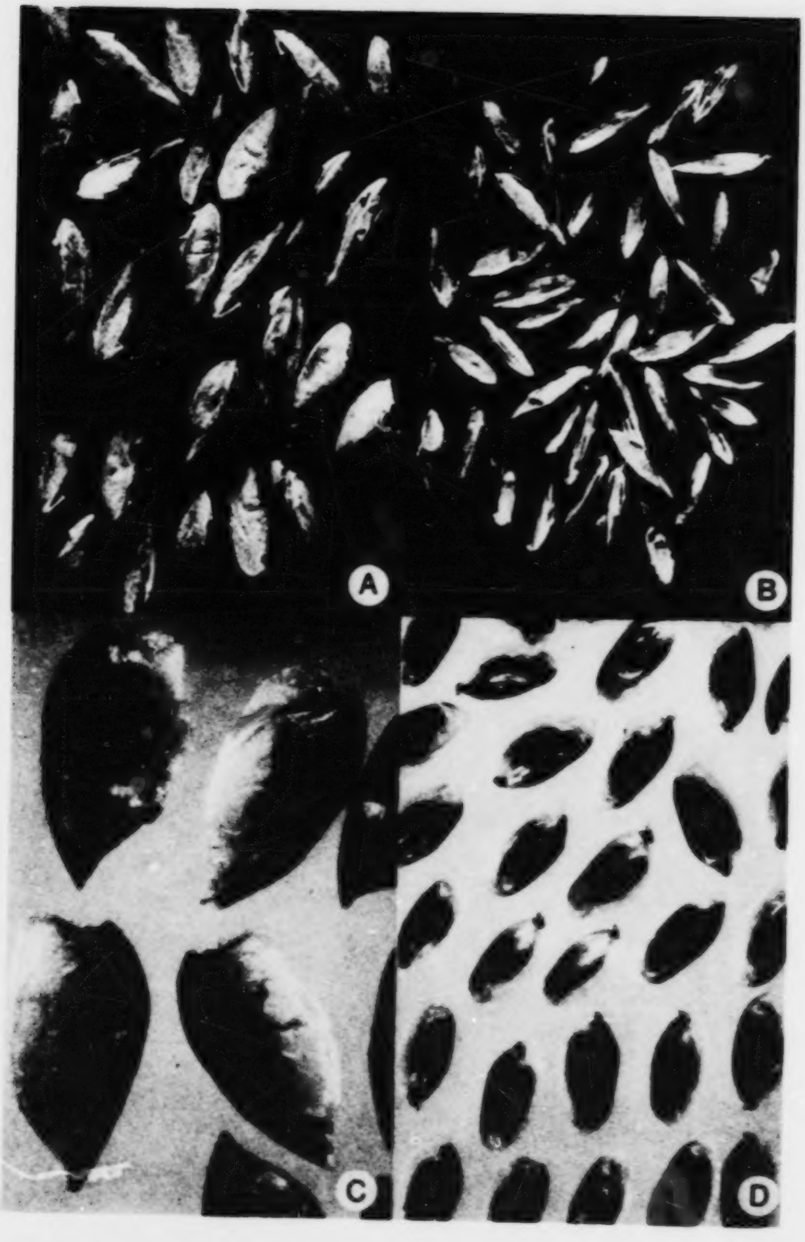


Plate 18. *A*, Florets of *Poa alpina* (Dore et al. 22899); *B*, Florets of *P. glauca* (Dore 9243); *C*, Florets of *Briza maxima* (James 2412); *D*, Florets of *B. media* (Kjellmert in 1951).

10. Briza L.

Introduced annual or perennial grasses. Foliage hairless; ligule membranous. Spikelets papery, heart-shaped, suspended from the ends of delicate panicle branches. Lemmas and glumes broad, wide-spreading, awnless, and faintly nerved.

A. Spikelets more than 10 mm long, generally single on the panicle branches; lemmas 6–8 mm long, inconspicuously hairy; plants annual, ornamental .... 1. ***B. maxima***
A. Spikelets 3–7 mm long, several on each panicle branch; lemmas 3–4 mm long, hairless
  B. Plants perennial; ligules 0.5–1.5 mm long; anthers 2.0–2.5 mm long .... 2. ***B. media***
  B. Plants annual; ligules 3.0–6.0 mm long; anthers 0.7 mm long .... ***B. minor*** (p. 144)

1. *Briza maxima* L.

Plate 18, Map 69

big quaking grass

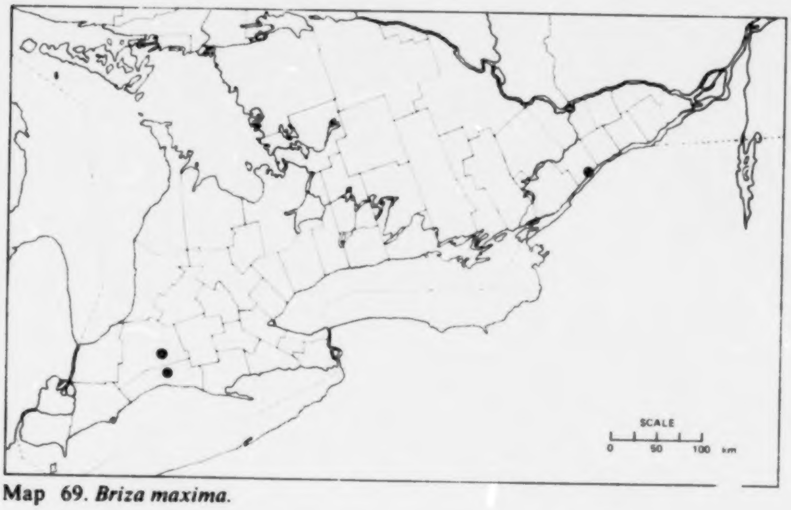
Briza maxima is an attractive grass and, like *Bromus brizaeformis*, is frequently cultivated for dry bouquets or as an oddity. First collected as early as 1861 at Prescott, Grenville County, by Billings, it sometimes springs up on waste heaps but does not ordinarily persist.

2. *Briza media* L.

Plate 18, Map 70

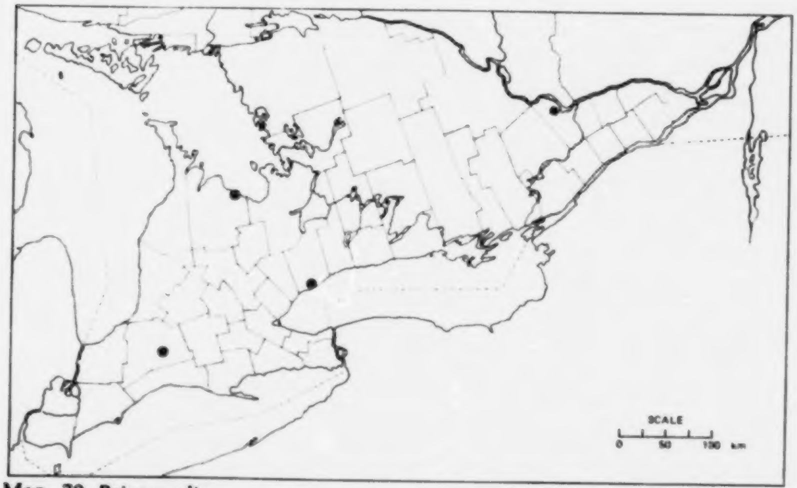
quaking grass

Accidentally introduced in early seed mixtures for meadows, *Briza media* does not usually persist for long. It was recorded by Macoun (1888) as naturalized in a meadow near London and credited to Millman (*see* Montgomery 1956). An earlier record is that based on a specimen from "University Park" dated June 1862, and initialed "W.H." It was presumably collected in Toronto by the Rev. Prof. William Hincks. More recent occurrences include Thornbury, Grey County, in 1948 and South March, near Ottawa, in 1974.



Map 69. *Briza maxima.*

Briza minor L.—This species, called little quaking grass, is known to have been cultivated at St. Thomas in 1954 from seed imported from Britain but has not yet been found as an escape.



Map 70. *Briza media.*

11. Eragrostis N. M. Wolf

Low-growing, mostly annual grasses. Leaves hairless, scabrous or sparsely ciliate, not conspicuously pubescent; ligule a row of hairs. Panicles open, delicate, with many spikelets. Spikelets 2- to 20-flowered. Glumes nearly equal, shorter than the lemmas, 1-nerved. Lemmas acute, awnless, 3-nerved, hairless or scabrous, falling away leaving the paleas on an unfractured rachilla.

- A. Perennial, deeply set and strongly rooted in soil; panicle large (20–40 cm), diffuse .... 7. ***E. spectabilis***
- A. Annual, loosely rooted in the soil; panicles relatively small, dense
  - B. Plants creeping, rooting at the geniculate nodes; native on muddy ditch banks and wet shores .... 1. ***E. hypnoides***
  - B. Plants upright or spreading from the base but not creeping by nodal rooting; introduced weeds of waste ground or gardens, generally on dry soil
    - C. Pedicels, panicle branches, keels of lemmas, and sometimes other parts glandular with minute crater-like depressions (sometimes sparsely so)
      - D. Well-developed spikelets 2.5–3.5 mm wide at base, pale green to lead-colored; glands usually 2–4 on the prominent keel of each lemma; leaf sheaths and blades generally hairless, only the ligule region papillose-pilose .... 2. ***E. cilianensis***
      - D. Well-developed spikelets 1.5–2.0 mm wide, usually purplish; glands seldom more than 2 and often absent on some of the lemmas of the spikelet; leaf sheaths, blades, and ligule region all sparsely papillose-pilose .... 3. ***E. minor***
    - C. Pedicels, panicle branches, and keels of lemmas lacking crater-like glands
      - E. Upper sheaths hairless on the collar; glumes smooth on the keel; pedicels 1–3 m long .... 6. ***E. multicaulis***
      - E. Upper sheaths pilose on the collar; glumes minutely scabrous on the keel; pedicels 2–8 mm long, occasionally longer
        - F. Spikelets 2- to 5-flowered, 1.5–2.5 mm long, on spreading pedicels; caryopsis about 0.5–0.6 mm long .... 4. ***E. frankii***
        - F. Spikelets in upper panicles 7- to 12-flowered, 4–6 mm long, on appressed pedicels; caryopsis about 0.8 mm long .... 5. ***E. pectinacea***

11. Eragrostis N. M. Wolf

1. *Eragrostis hypnoides* (Lam.) Britton, E. E. Sterns, & Poggenb.

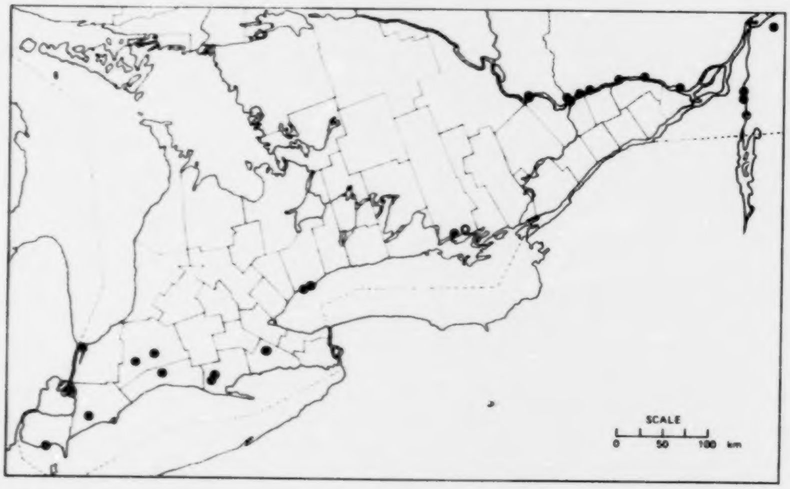
Plate 19, Map 71

moss-like love grass

A low-growing delicate plant, *Eragrostis hypnoides* tends to creep over wet alluvial mud, rooting from the nodes. It is the only native species of the genus and seems to be rare in Ontario.

Macoun (1888) records it as common on alluvial soil near Belleville, along the Salmon River near Shannonville, and in many other places in Hastings County, but only one specimen, labeled "Moira River, Canada, 1872," is known from this area. In the Toronto region it was collected on the Don River flats in 1881 and 1894, and at Mimico Creek in 1896. An unlocalized collection labeled "Toronto" is dated 1911, but since then no specimens have been collected from the area. Documented records from the southwestern counties are more numerous, including some rather recent ones.

The species is found at London and Strathroy in Middlesex County; near St. Thomas, Elgin County; Thames River, Chatham, Kent County; Arner, Essex County; Walpole Island, Lake St. Clair; and Sarnia. In the Ottawa Valley the species was first recorded in 1891, but apart from a Macoun collection at the Chaudiere Falls, Ottawa, all are from the Quebec side of the Ottawa River. The plant is also known along the Richelieu River in Quebec and the Assiniboine River in Manitoba.



Map 71. *Eragrostis hypnoides.*

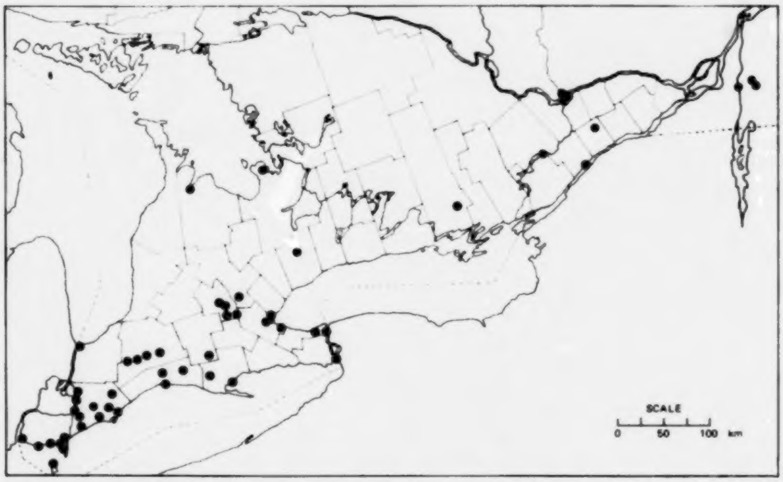
The species was at one time known by the name *E. reptans* (Michaux) Nees, but this correctly applies to a distinct dioecious species not found in Ontario (Hitchcock 1926).

2. *Eragrostis cilianensis* (All.) Lutati ex Hubbard (*E. megastachya* (Koeler) Link)

Plate 19, Map 72

stink grass

Eragrostis cilianensis is a rather decorative grass with pale green or metallic gray spikelets, but it is a serious weed in gardens and waste places west and south of Toronto. Early records in this area include Fort Erie in 1877, London in 1879, Leamington, Essex County in 1881, Windsor in 1884, and Queenston in 1896. Outside of this area of concentration, single collections were made at Owen Sound as early as 1874, and more recently at Rainy River, at Tweed, Hastings County, Smiths Falls, Lanark County, Winchester, Dundas County, and Prescott, Grenville County. Collections made at the Experimental Farm in Ottawa in 1900, 1909, 1911, and 1934 seem to be individual occurrences that did not persist; others in the Ottawa area may indicate incipient infestations. The weed was also found at Halifax, Nova Scotia, in 1938, around Rougement, Quebec, in 1950, in southern Manitoba in 1950, and at Estevan, Saskatchewan, in 1960. The species is native to Europe, but seems to have migrated into different regions of Canada from the adjoining parts of the United States.



Map 72. *Eragrostis cilianensis*. All known Canadian records from the area covered by the map are plotted. The species has also been collected at Rainy River in northern Ontario.

This species as well as other annual members of the genus is peculiar in that the spikelets in the lower part of the panicle and on the secondary panicles are smaller and fewer flowered than the others on the same plant. Well-developed spikelets measure 10–15 mm, these younger ones may be only 3–4 mm long, and under abnormal conditions all spikelets on a plant may be dwarfed, giving rise to difficulties in identification. The plant is said to have a disagreeable odor rising from a volatile substance in the crater-like glands, characteristic of several species of the genus. If the odor does exist, it is not pronounced.

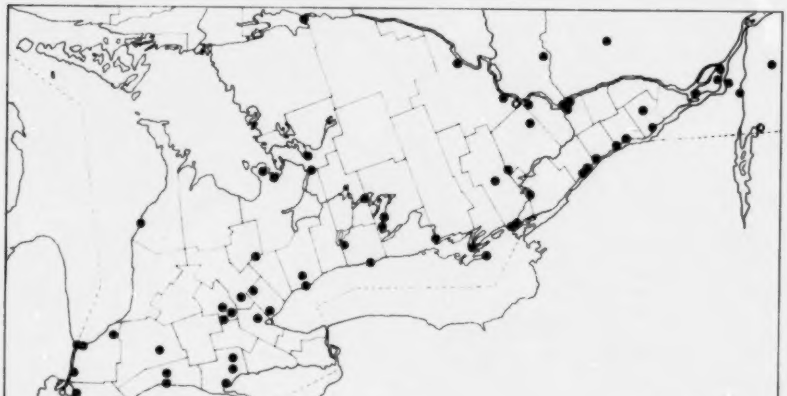
The nomenclature of this species is still confused and the name *E. megastachya* has also been widely used (*see* McNeill and Dore 1977). In adopting *E. cilianensis* we are conforming to our practice of departing from the nomenclature used in Hitchcock and Chase's *Manual* (1951) only when that work is definitely wrong.

3. *Eragrostis minor* Host (*E. pooides* Beauv.)

Plate 19, Map 73

little love grass

Eragrostis minor is a smaller weed than *E. cilianensis* with more slender and spreading stems and with purple rather than pale or lead-colored spikelets. It was apparently introduced into Ontario in the last three



Map 73. *Eragrostis minor*. All known Canadian records from the area covered by the map are plotted.

decades, but is now the most widely distributed and commonest species of the genus. It occurs almost exclusively on railroads or cinders of railway yards, gravelly roadsides, and cracks in pavement. It is distributed throughout much of southern Ontario, from the Ottawa Valley to Sarnia, with local outbreaks farther north at Kincardine, Bruce County, around Midland and Port McNicol in Simcoe County, Gravenhurst, Muskoka, and at North Bay. It is not yet known in the Niagara Peninsula. The species was originally introduced from Europe.

E. minor and *E. cilianensis* have sometimes been grouped together because of their general similarity. They differ most notably in size and indeed *E. cilianensis* was at one time known as *E. major* Host. The name "*E. pooides*" has generally been used for *E. minor* in recent years. This usage was based on the mistaken belief that *E. minor*, the earlier name, had not been validly published (McNeill and Dore 1977).

4. *Eragrostis frankii* C. A. Meyer ex Steudel

Plate 20, Map 74

Frank's love grass

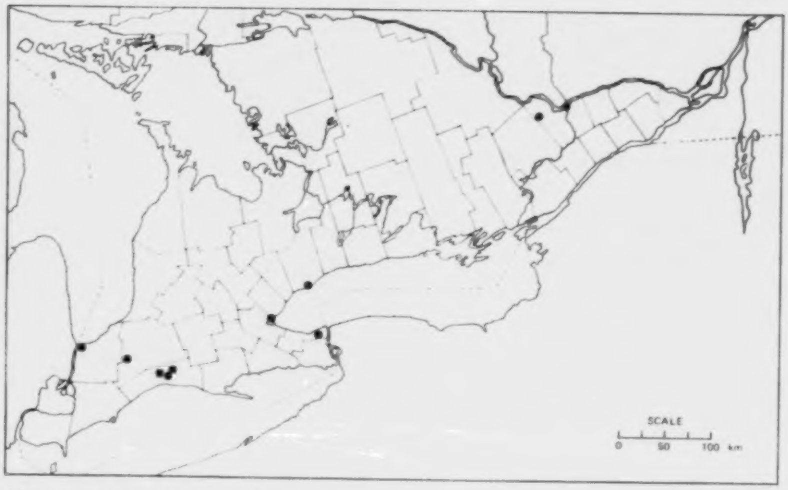
Eragrostis frankii is as yet of rare occurrence in the province although it was detected early as "a weed in a peach orchard, near St. Catharines, Ont., 1898" and reported under the name *E. capillaris* by J. M. Macoun (1899). Other early collections are from Sarnia in 1900; Strathroy, Middlesex County, in 1905, and Swansea, Toronto, in 1912. More recently the species has been collected in various parts of Elgin County, in a few localities near Ottawa, and south of Barrie in Simcoe County. Although the species is native to the eastern United States, the occurrences in Ontario are considered to be introductions because they are sporadic and confined to gardens or roadsides. *E. frankii* is not known elsewhere in Canada. The published records for Quebec (Cleonique-Joseph 1937) and New Brunswick (Boivin 1967) are based on *E. multicaulis* and *Muhlenbergia uniflora* respectively.

5. *Eragrostis pectinacea* (Michaux) Nees

Plate 20, Map 75

tufted love grass

Eragrostis pectinacea is more delicate in panicle than *E. minor* and generally has greenish rather than purplish spikelets; however, it has spread just as rapidly as a weed along sandy roadsides and railroads. It is now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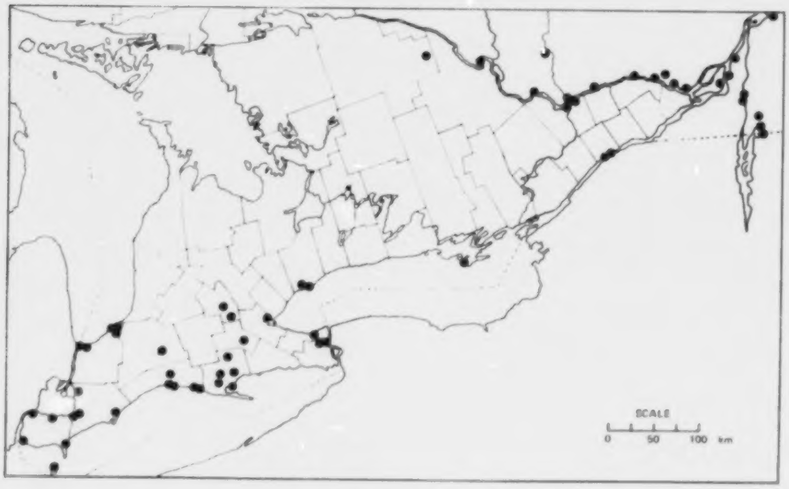
Map 74. *Eragrostis frankii.*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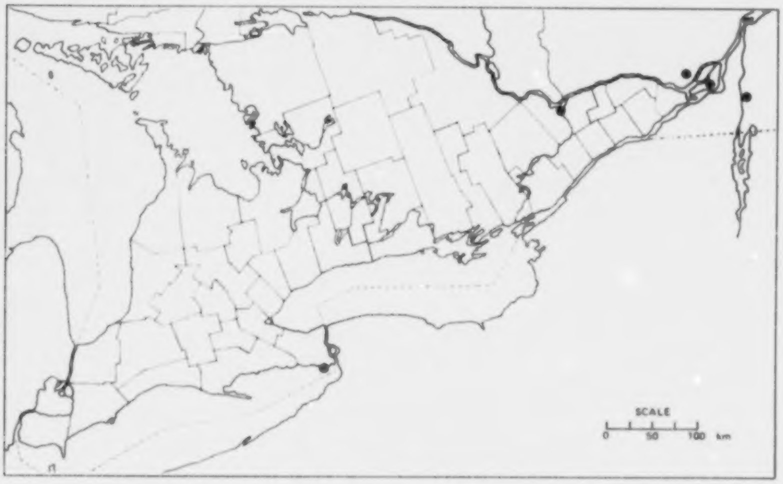
Map 75. *Eragrostis pectinacea.* All known Canadian records from the area covered by the map are plotted. The species has also been collected at Rainy River in northern Ontario.

abundant in southern Ontario south and west of Toronto with additional infestations in the Ottawa Valley and around Prescott and Morrisburg. The species seems still to be absent from the region north and east of Toronto. Some of the early collections are from Windsor in 1885, Belle River in 1894, Niagara in 1897, and Sarnia in 1899. Collections away from these border points in the southwest were not made until 1921 at Chatham, 1925 at Kitchener, 1933 at Ottawa, 1954 at Morrisburg, 1962 at Achray in Algonquin Park, and 1961 at Rainy River. Core's report (1948) of *E. pilosa* from Pelee Island also refers to *E. pectinacea*.

6. *Eragrostis multicaulis* Steudel

Map 76

Zenkert (1934), on the basis of a specimen cited by House (1930), records *Eragrostis multicaulis* from Point Abino, Lake Erie, in 1924 under the synonym *E. peregrina* Wieg; the supporting specimen has not, however, been traced. The species is abundant in southern Quebec (La Trappe, Montreal, St. Jean, Cowansville), as well as in adjoining states, so its invasion of Ontario is to be expected. In 1974, a single plant was found in the Macoun Memorial Garden, Central Experimental Farm, Ottawa. The weed was promptly eradicated.



Map 76. *Eragrostis multicaulis*. All known Canadian records from the area covered by the map are plotted.

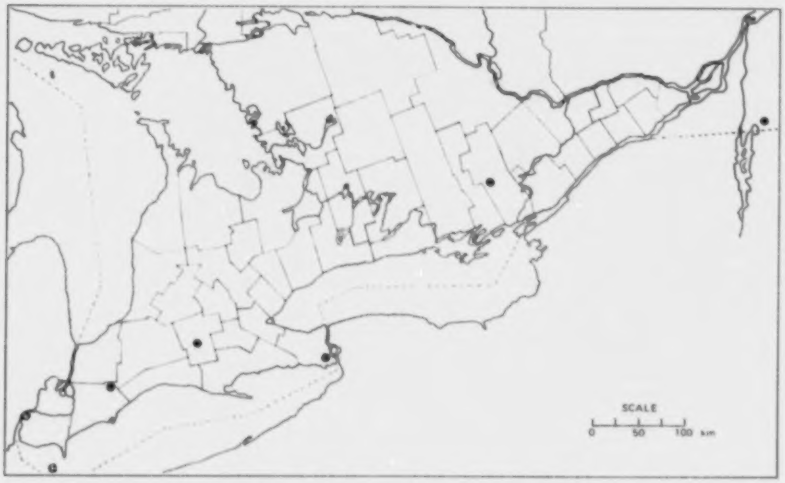
Prior to Wiegand's study (1917) there was much confusion regarding the identity of this eastern Asiatic species; consequently it is impossible to assess the earlier literature records under the name *E. pilosa* and *E. purshii*. The name Wiegand proposed, *E. peregrina*, must be replaced by the much earlier *E. multicaulis*.

7. *Eragrostis spectabilis* (Pursh) Steudel

Plate 20, Map 77

purple love grass

A common tumbleweed of sandy soil throughout the eastern United States, *Eragrostis spectabilis* was recorded from Pelee Island by Core (1948). Since then it has been collected along the railway at Sharbot Lake in 1952, at Woodstock in 1953, and in railway yards at Welland in 1976. The only Canadian record outside of Ontario is of a patch on the railroad near Stanstead Station, Quebec. In each of these localities the species occurs as an adventive. However it is known on a sand barren near Malone, New York, about 24 km from the Ontario border, where it is of native occurrence. It has also recently been reported as occurring as a native in prairie-like habitats in Kent and Essex counties (Thompson 1975). All the Ontario specimens have pilose sheaths, the characteristic of var. *sparsihirsuta* Farwell, but this taxon does not appear to be worthy of distinction.



Map 77. *Eragrostis spectabilis*. All known Canadian records from the area covered by the map are plotted.

Eragrostis tef (Zuccagni) Trotter (E. abyssinica (Jacq.) Link)—This species is an annual 30–100 cm high with a large open panicle and spikelets 6–8 mm long. It is a native forage species in Africa known as teff. It was first cultivated at the Experimental Farm in Ottawa in 1890, then given trials at various establishments across Canada between 1926 and 1936. It is not suitable for close grazing and has not persisted under Ontario conditions.

Eragrostis neomexicanus Vasey; E. orcuttiana Vasey—These species, which are natives of the southern United States, infested the forage introduction garden at the Experimental Farm, Ottawa. *E. neomexicanus* was found in 1942 but did not persist, whereas *E. orcuttiana* appeared in 1952 and persisted until 1964. Both are robust annuals growing up to 1 m high, the former with ovate to ovate-oblong spikelets and the latter with slender, linear ones.

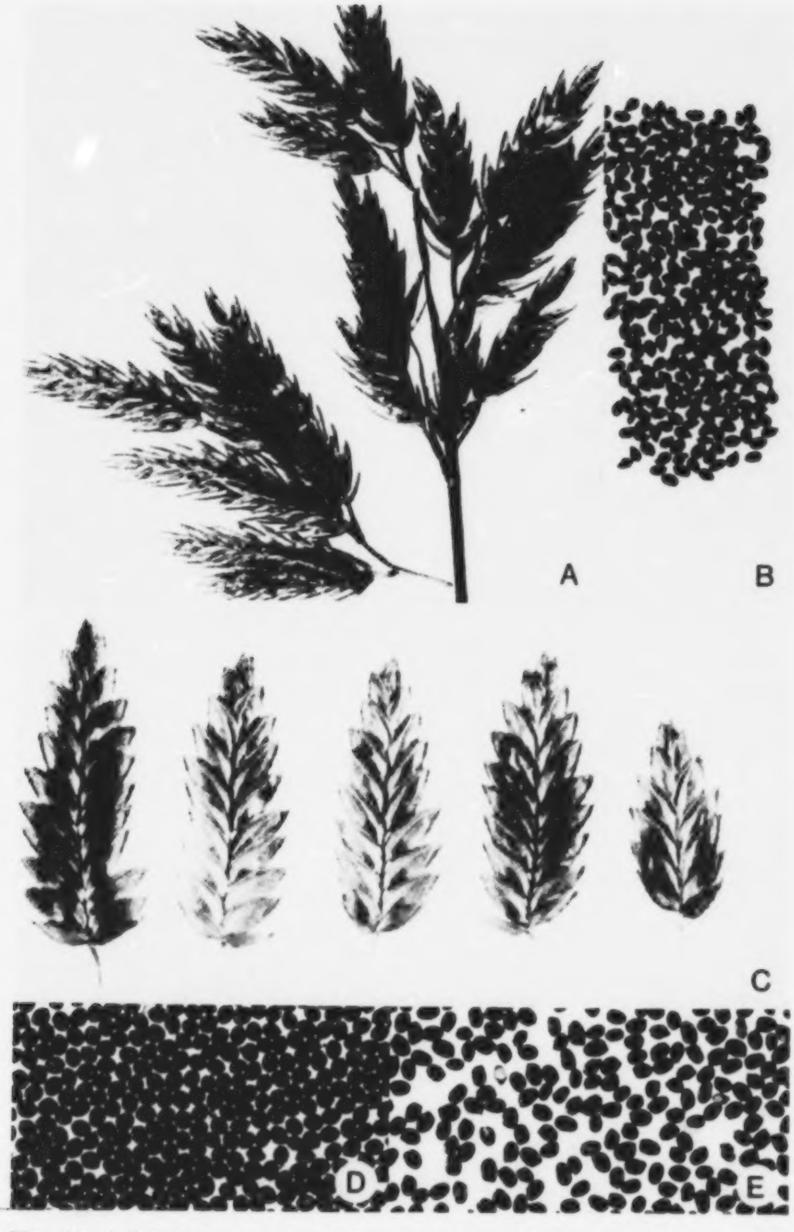


Plate 19. *A*, Spikelets of *Eragrostis hypnoides* (Scott in 1911); *B*, Caryopses of *E. hypnoides* (Scott in 1911); *C*, Spikelets of *E. cilianensis* showing keel glands (Dearness in 1896); *D*, Caryopses of *E. cilianensis* (James 28); *E*, Caryopses of *E. minor* (Shumovich 1581).

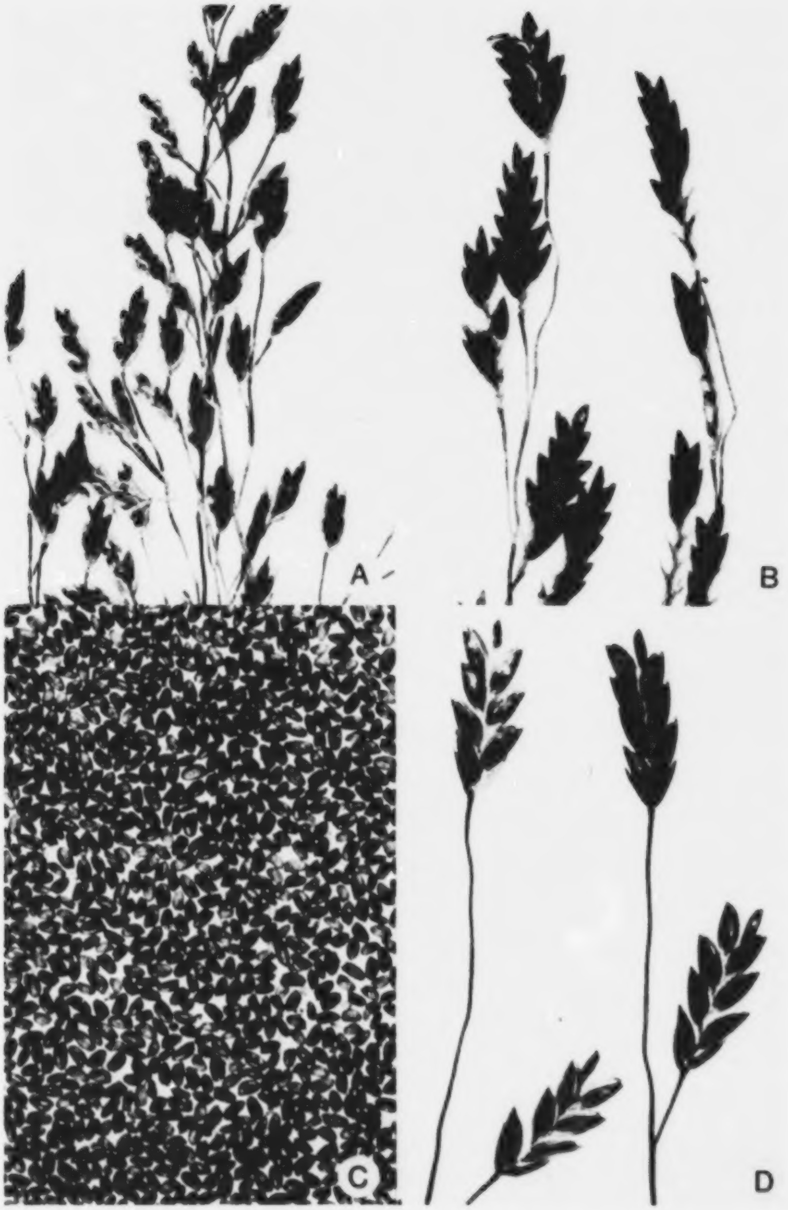


Plate 20. *A*, Spikelets of *Eragrostis frankii* (James 1588); *B*, Spikelets of *E. pectinacea* (Gillett 10809); *C*, Caryopses of *E. pectinacea* (Gillett 10809); *D*, Spikelets of *E. spectabilis* (Koyama 13226).

12. Catabrosa Beauv.

Creeping perennial grasses of water-saturated soil in springs or in seepage areas along seacoasts. Branch shoots arising from buds at top of culm internodes. Leaf blades broad, soft, hairless, light green; ligule membranous, white. Panicle with horizontally spreading, delicate, minutely papillose-scabrous branches, rather loosely flowered, with small brownish spikelets. Spikelets 2-flowered in the upper part of the panicle of vigorous plants, 1-flowered on secondary branches or on depauperate plants. Glumes much shorter than florets, membranous, nerveless, blunt and irregularly toothed at top. Lemmas strongly 3-nerved, blunt and membranous at tip.

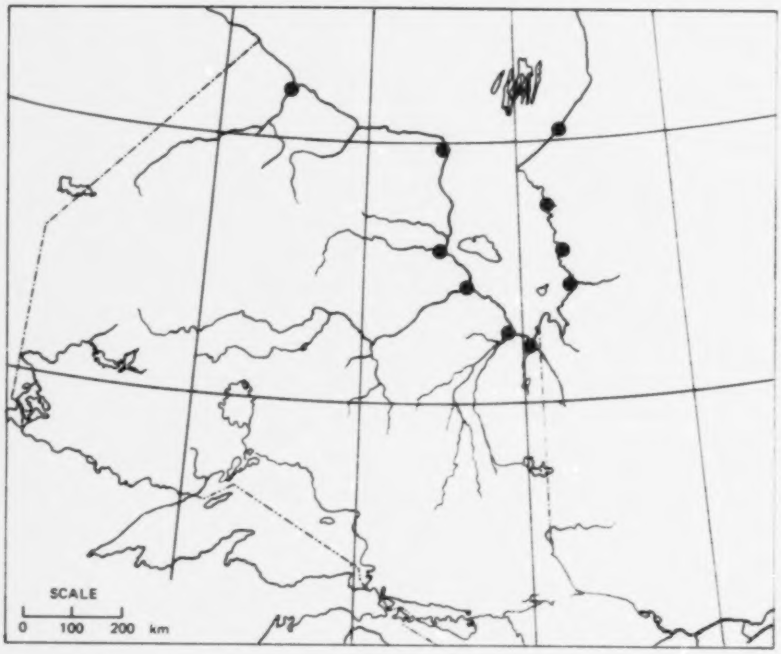
1. *Catabrosa aquatica* (L.) Beauv.

Map 78

brook grass

In Ontario *Catabrosa aquatica* is localized along James Bay and southern Hudson Bay. It was first collected by J. M. Macoun at Severn River in 1886, and by Spreadborough at Moose Factory in 1904, but not again until 1954 by Stirrett at Hannah Bay and between 1945 and 1955 by Dutilly and Lepage at Moosonee, Albany, Attawapiskat and south of Cape Henrietta Maria; all localities were apparently along the estuaries of rivers.

Two varieties have been recognized in North America. One, var. *laurentiana* Fernald, occurs in the east around the Gulf of St. Lawrence and is supposedly distinguished by its panicle branches being floriferous almost to the base. The other, which has been referred to the European var. *uniflora* S.F. Gray, is a western variety present in the southern Prairie Provinces. Both are said to be distinguishable from the Eurasian var. *aquatica* by their shorter panicles and 1-flowered spikelets. Both var. *laurentiana* and var. *uniflora* are represented in the James Bay area according to Dutilly, Lepage, and Duman (1954); at Attawapiskat they are said to form separate patches in the same habitat. A critical appraisal of these varietal differences and their distribution is needed and the disjunct James Bay occurrence of the species would be of particular interest in such a study.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Map 78. *Catabrosa aquatica.* All known Canadian records from the area covered by the map are plotted.

13. Molinia Schrank

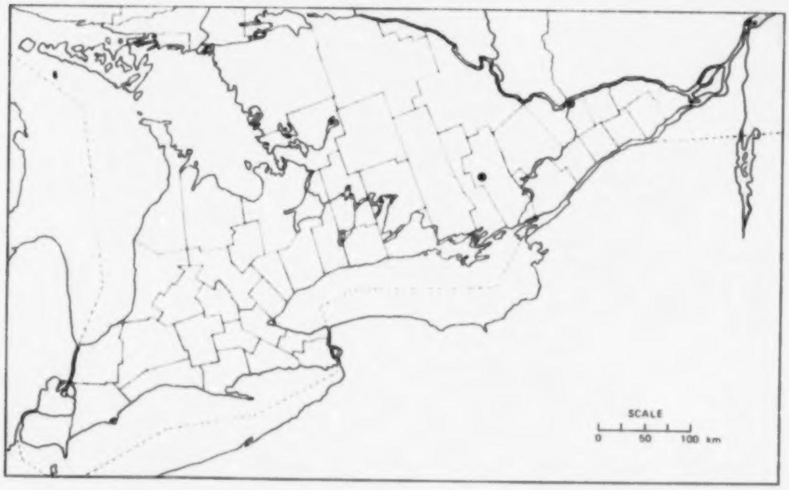
Coarse-tufted perennials with tough fibrous roots. Leaf blades tapering to a long point and breaking away at the collar; hairs present at top of sheath and toward base of blade; ligule a row of very short hairs. Panicle large, elongate, purplish (in our species). Spikelets 2- to 4-flowered, with the rachilla prolonged above the upper floret. Glumes 1-nerved, hairless. Lemmas 3-nerved, hairless.

1. *Molinia caerulea* (L.) Moench

Plate 21, Map 79

flying bent, purple heath grass

Molinia caerulea is known in one area in Ontario, between Mountain Grove and Cedarholme in Frontenac County, where a large patch was discovered in 1948 in the sedgy portion of an old clearing along Highway 7.



Map 79. *Molinia caerulea.*

It was probably introduced in hay seed many years earlier. Other plants became established later and grew vigorously on the ballast for a kilometre or two along the highway. At Ottawa a single clump in an old cottage property by the Rideau River (Dore 1959) disappeared after the development of Vincent Massey Park. Other sites in Canada where *M. caerulea* has been long established are at Louisburg, Nova Scotia, and in Newfoundland. More recently it has been discovered at Montebello, Quebec, 80 km east of Hull (Cayouette 1972).

M. caerulea is a tussock grass abundant in wet moorland in Europe and grazed by sheep only in the early spring. The name flying bent comes from the fact that the dead blades, abscising at the collar, blow across the moors on the wind.

Several variants have been recognized in Europe, sometimes as one or more separate species. Plants more than 1.2 m high with larger panicles and spikelets and said to be consistently decaploid ($2n = 90$) have been termed *M. litoralis* Host (*M. caerulea* subsp. *litoralis* (Host) Paul; *M. arundinacea* Schrank var. *litoralis* (Host) Grabherr). The plants from Frontenac County are of this large sort, but their chromosome number has not been determined.

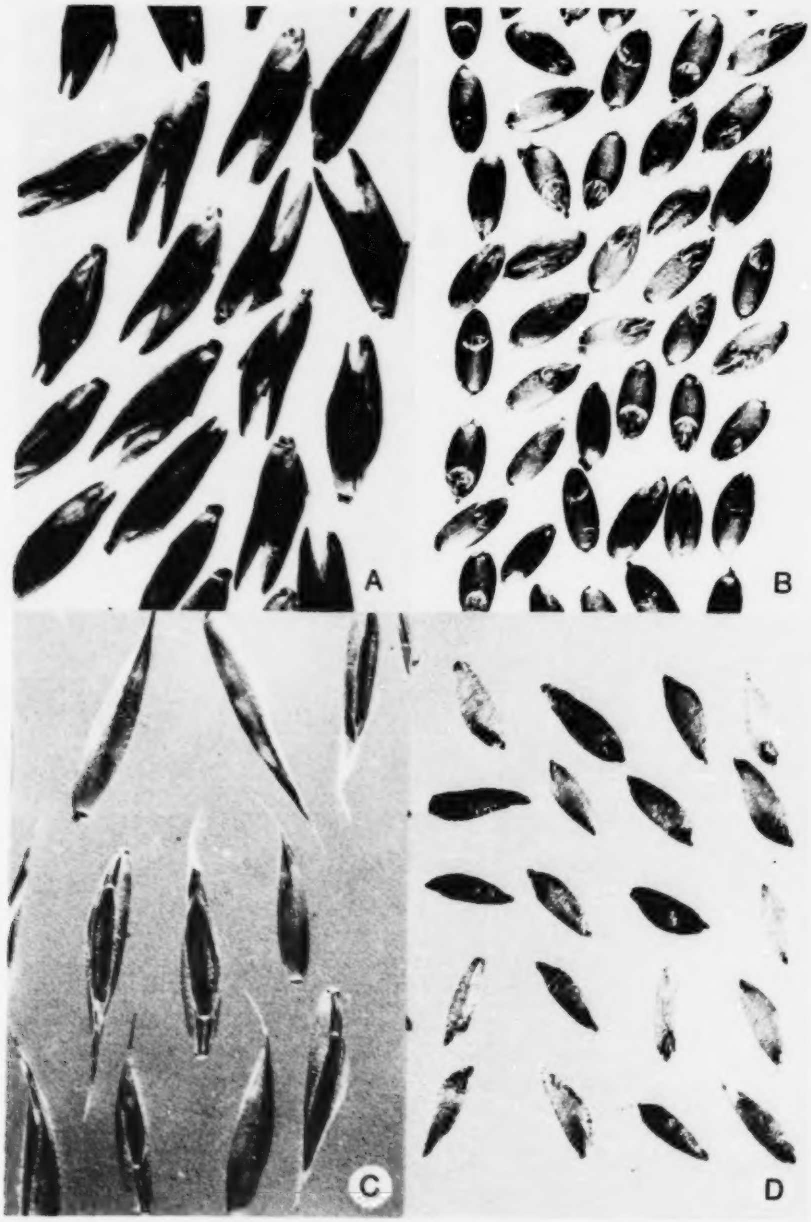


Plate 21. *A*, Florets of *Molinia caerulea* (Dore and Marchant 18424); *B*, Caryopses of *M. caerulea* (Dore and Marchant 18424); *C*, Florets of *Dactylis glomerata* (Groh 1909); *D*, Caryopses of *D. glomerata* (McMorine in 1895).

14. Dactylis L.

Stout, tufted perennials with strongly flattened culms. Leaf blades broad, pale green, hairless, flat but generally folded along a prominent midvein; ligule long, white, membranous. Panicle somewhat 1-sided, composed of dense glomerules aggregated at the ends of stiff branches. Spikelets strongly flattened, almost sessile, 3- to 8-flowered. Glumes and lemmas ciliate on the keels, sometimes sparsely pubescent, elsewhere shortly awned.

1. *Dactylis glomerata* L.

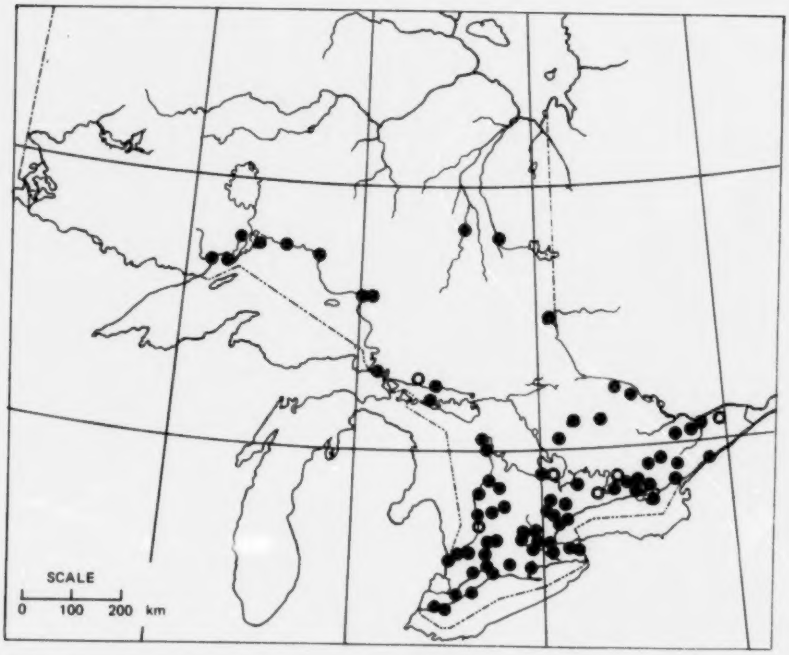
Plate 21, Map 80

cocksfoot, orchard grass

A common and valuable forage species, *Dactylis glomerata* is widely used in meadows and pastures particularly in southwestern Ontario where winter conditions are less severe. It is rather drought resistant and prefers fertile, well-drained soils. An early introduction from Europe, orchard grass is now well established as an escape along roadsides, railroads, and in wasteland throughout the settled portions of the southern part of the province. In northern Ontario it is less abundant and has been recorded sporadically since 1935. It has not yet been found west of Thunder Bay.

All Ontario plants seem to belong to the widespread northern and central European subsp. *glomerata*, which is tetraploid. Within this variable taxon, numerous varieties and forms have been recognized on the basis of the degree of pubescence of spikelets and leaves, or the color and conformation of the inflorescence. Several of these are represented in our naturalized populations. More significant from an agricultural standpoint are the strains developed for greater yield, leafiness, winterhardiness, and disease resistance, which are features that are not correlated with the easily recognized morphological ones.

In second-growth stems after mowing, the spikelets often proliferate vegetatively to present interesting oddities that Arber (1934) refers to as "bouquet inflorescence." This physiological condition, more prevalent in reclining stems and in moist cool years, does not appear to be of importance in field propagation.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Map 80. *Dactylis glomerata* subsp. *glomerata*.

15. Cynosurus L.

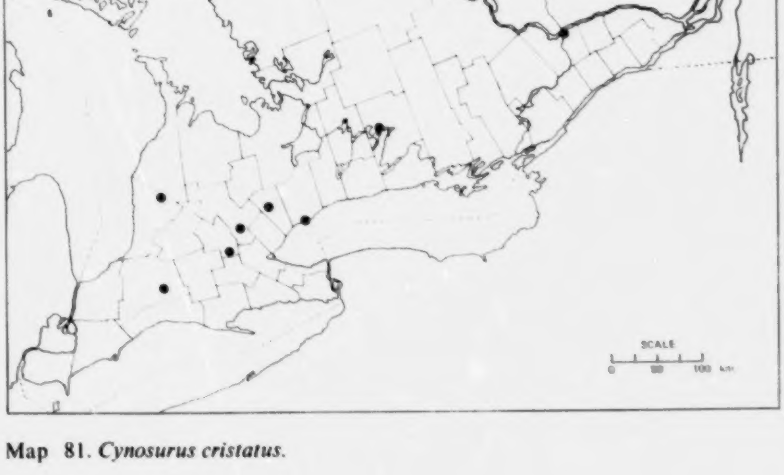
Tufted perennials, with slender stems and hairless foliage. Panicle spike-like because of the shortness of its spikelet-bearing branches. Spikelets of two kinds (sterile and fertile) at each node. Sterile spikelets consisting only of numerous bracts (glumes and lemmas), lacking stamens and pistils; fan-shaped fertile spikelets slightly shorter and obscured by the sterile spikelets.

1. *Cynosurus cristatus* L.

Plate 22, Map 81

crested dogtail

In addition to the generic characteristics, *Cynosurus cristatus* can be recognized by its bright yellow inner leaf sheaths that become brownish yellow with age, and by its narrow spike with a visible zigzag rachis arising from the spikelets being turned to the side.



Map 81. *Cynosurus cristatus.*

The species was undoubtedly introduced, intentionally or unintentionally, to all parts of settled Ontario as a component or impurity of seed mixtures for lawns and pastures, but it is not persistent.

Early collections include those from London in 1885, Ottawa in 1888, Snelgrove, Peel County, and Wingham, Huron County, in 1892, and Balmy Beach, Toronto, in 1898. It was also collected by Mrs. Catherine Parr Traill on her island of Minnewawa in Stony Lake near Peterborough in the 1890s (Dore 1966). The Wellington County record (Stroud 1941) represents material cultivated at Guelph.

In Europe, crested dogtail is valuable in pastures and lawns because of its winterhardiness and drought resistance, but Ontario conditions restrict its persistence to a year or two. In coastal British Columbia it is extensively naturalized.

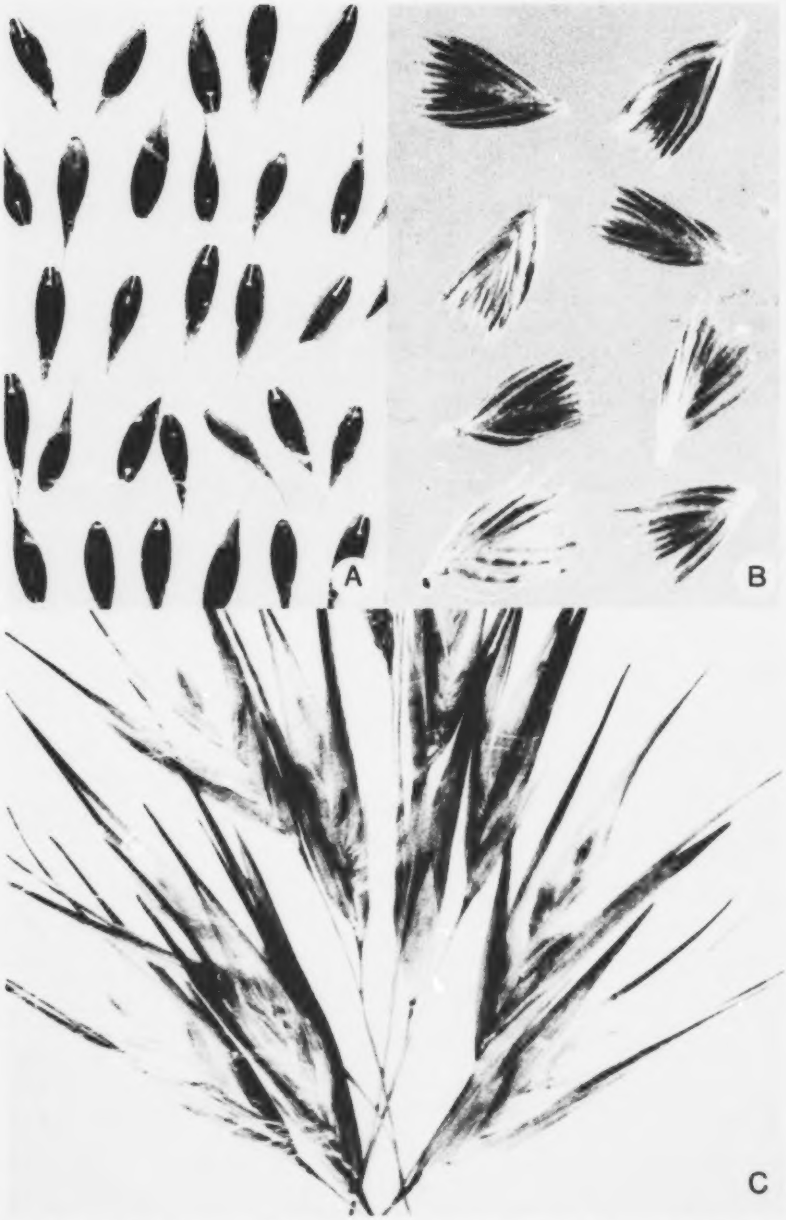


Plate 22. *A*, Fertile florets of *Cynosurus cristatus* (cultivated at Ottawa in 1945); *B*, Sterile florets of *C. cristatus* (cultivated at Ottawa in 1945); *C*, Spikelets of *Phragmites australis* (Landon in 1949).

16. Phragmites Adanson

Tall broad-leaved perennials, growing in cane-like thickets from stout rhizomes. Culms hard, hollow; leaf blades broadly linear, flat; ligule fine membranous, soon fraying into a row of short matted hairs with longer, fragile hairs at the collar. Panicle large, plume-like, and silky when mature, produced late in summer. Spikelets several-floreted, with long soft hairs from a rachilla that breaks above rather than below the florets.

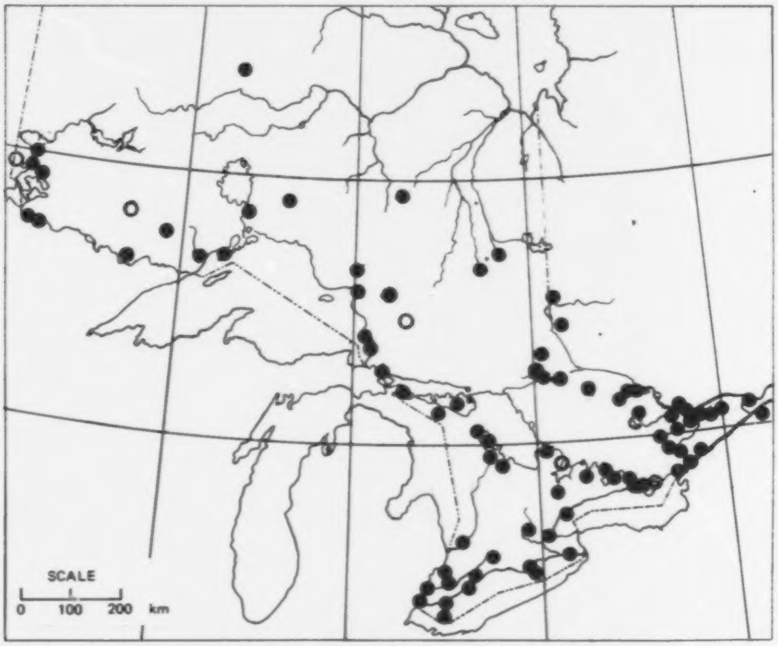
1. *Phragmites australis* (Cav.) Trin. ex Steudel (*P. communis* Trin.)

Plate 22, Map 82

common reed, phragmites

The tallest of our native grasses, *Phragmites australis* stands 2–3 m high usually in shallow marshy waters, but it can also flourish on muddy shores and riverbanks. It tends to form continuous patches, sometimes extending over wide areas by the outward growth of coarse sharp-pointed rhizomes. In unusual situations such as on eroded flood shores or shingle beaches where the soil is open or the bedrock shallow, the rhizomes may spread to the surface as stolons and grow to considerable lengths in one season, producing unusually small green leaves and occasionally an erect shoot at weakly rooting nodes.

In Ontario, the species is most abundant in the southern Kenora District and the adjacent Rainy River District. In the wet plains of the latter, the stands are often extensive and similar to those found in southeastern Manitoba. Farther north, however, the patches are small and more widely scattered. The species does not cover large areas and apparently reaches its limit of range just north of the Albany River. In the southern part of the province, it is more prevalent close to the shores of the Great Lakes. At places where shallow muddy embayments are available, such as Kettle Point on Lake Huron, around Lake St. Clair, at Point Pelee, Rondeau, Long Point, and Turkey Point on Lake Erie, and at Hamilton, Toronto, Bay of Quinte, and Kingston on Lake Ontario, the grass may become the dominant species of the marsh vegetation. Apart from patches well established at Hespeler, Waterloo County, Dutton, Elgin County, and London, occurrences inland from the Great Lakes are mainly restricted to the Trent System and to the low land south and east of Ottawa that once was covered by the Champlain Sea. There are also moderate concentrations recorded along Lake Nipissing and in the Petawawa area in the upper Ottawa Valley. These may result from a former lake connection with Georgian Bay. The significant absence of records from the Parry Sound District, Haliburton, and Algonquin Park to the south tends to support a pattern of migration by vegetative means.



Map 82. ***Phragmites australis.***

Even when full panicles and perfect flowers are produced, no sound grains are known to be formed by Ontario plants. Whether this is because the season is too short for their maturation or because of self-incompatibility coupled with clonal spread is not known. The condensed nature of the clones and their confinement to small locations in areas with other apparently suitable marshland habitats further testifies to the present-day ineffectiveness of seed propagation.

The name *Phragmites communis*, long accepted for this worldwide grass, is abandoned with great reluctance. The epithet *australis* was published 21 years before *communis*, although this and the fact that they refer to the same species was ignored for nearly 150 years (Clayton 1968). There is, however, still no provision in the *International Code of Botanical Nomenclature* for the conservation of specific names, however widely used they may have been.

The North American plants are said to have slightly longer glumes than the Eurasian plants (Fernald 1932) and have been distinguished alternatively at varietal or subspecific rank as *P. communis* var. *berlandieri* (E. Fourn.) Fernald or *P. communis* subsp. *berlandieri* (E. Fourn.) A. & D. Löve. The distinction is of doubtful validity, particularly in the context of the total range of variation in glume size in populations throughout the world (Clayton 1967).

In the parts of Europe where it is abundant, common reed has long been exploited for thatch and matting purposes and, more recently, for construction board. In Canada the grass has had many uses by native peoples and provides some value as decoration when cut for the home or when planted outdoors in aquatic gardens.

***Cortaderia selloana* (Schultes) Ascherson & Graebner**—This species, known as pampas grass, is a tall perennial unisexual grass with large ornamental panicles; those on the pistillate plant are silvery and plume-like because of long rachilla hairs and white papery lemmas. These are often dyed for decoration. It has been known under the name *C. argentea* (Nees) Stapf and *Gynerium argenteum* Nees. It is not hardy in Ontario and is not usually grown there. However, a specimen exists from a plant cultivated at the Ontario Agricultural College (University of Guelph).

17. Melica L.

Slender perennials with weak culms, often with slender corms at the base. Leaf blades flat; sheaths closed to near the top; ligule membranous, erose. Panicle lax, simple. Spikelets 2- to several-flowered, only the lower being perfect, the upper composed of progressively smaller empty lemmas; lemmas many-nerved, thin, scabrous.

Panicle lax, the branches 3–4, distant, spreading; spikelets 18–20 mm long; glumes and lemmas ovate-lanceolate, acute, herbaceous .... 1. ***M. smithii***
Panicle dense, the branches numerous, close together, ± erect; spikelets ca. 12 mm long; glumes and lemmas broadly ovate, obtuse, papery .... 2. ***M. altissima***

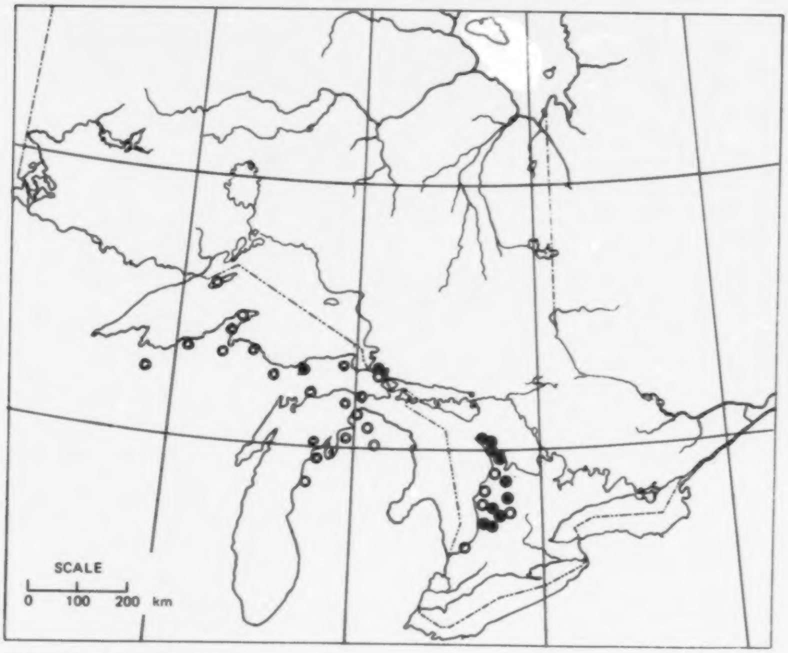
1. *Melica smithii* (Porter) Vasey

Plate 23, Map 83

Smith melic grass

A rare grass, *Melica smithii* was long known only from the eastern side of the Bruce Peninsula where it was originally collected at Colpoy's Bay in 1908 (Klugh 1908). It was later found to be "rather common in damp rich woods throughout the Bruce" (Krotkov 1940). An older collection by J. A. Morton, "Wingham, July 1892," had been overlooked because it was suspected of being erroneously labeled. A special search in 1966 during late June, when this grass is conspicuous, revealed further occurrences in original woodlands in Perth, Huron, and Grey counties. Dodge (1914) reported the species from Lambton County as occurring in "rich woods near Port Franks, apparently infrequent." Although this was not verified by Gaiser's work (Gaiser and Moore 1966), it seems reliable. In 1964, a small patch was discovered in rich alluvial woods along the St. Marys River near Sault Ste. Marie, a habitat now destroyed. This station would be near the type locality "woods near Sault Ste. Marie, Michigan," where it was collected by C. E. Smith in the 1860s.

Maps of the overall distribution (Fernald 1935, p. 217; Boyle 1945) show that it also occurs and is more widespread in British Columbia and the northwestern United States. Its disjunct presence in the Bruce Peninsula and upper Great Lakes area (***see map in*** Voss and Crow 1976, p. 67) has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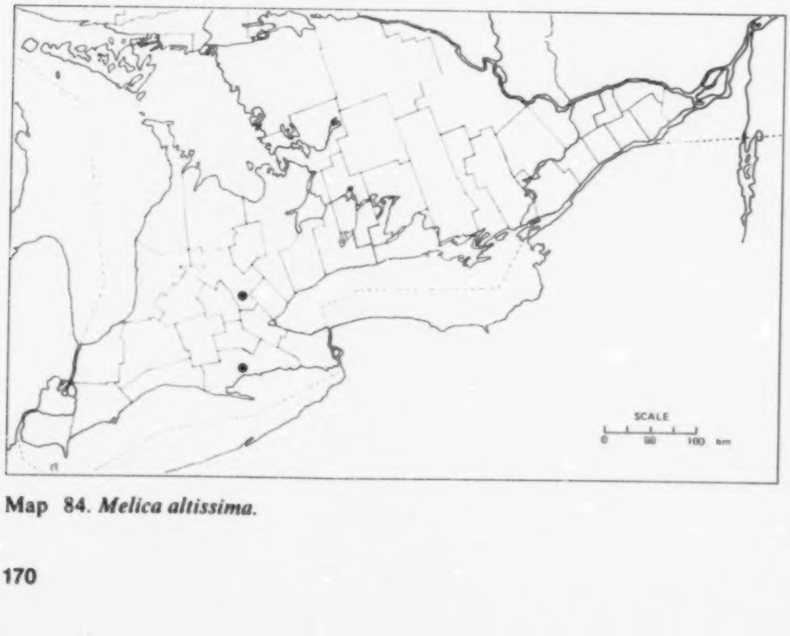
Map 83. *Melica smithii.*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Map 84. *Melica altissima.*

been explained either by local survival through the Wisconsin glaciation or on postglacial migration in the Xerothermic Period (*see* Fernald 1935, pp. 216–218). Its pattern of occurrence and ecological behavior, like that of *Festuca occidentalis* and a few other species with Cordilleran affinity, suggest long establishment in Ontario and inability to colonize under present-day conditions. Persistence of this grass is dependent on grazing and maintenance of natural forest. Stigmas and anthers protrude conspicuously at anthesis but seed setting in Ontario is precarious because of local isolation of clones.

2. *Melica altissima* L.

Map 84

A tall ornamental species with a long panicle of papery spikelets, *Melica altissima* is sometimes grown in gardens. In 1949 (Landon 1960) it was found as an escape in an unkempt yard at Simcoe. Two specimens from Guelph collected in 1920 probably represent an earlier establishment and are the basis of the record of *M. mutica* for Wellington County by Stroud (1941).

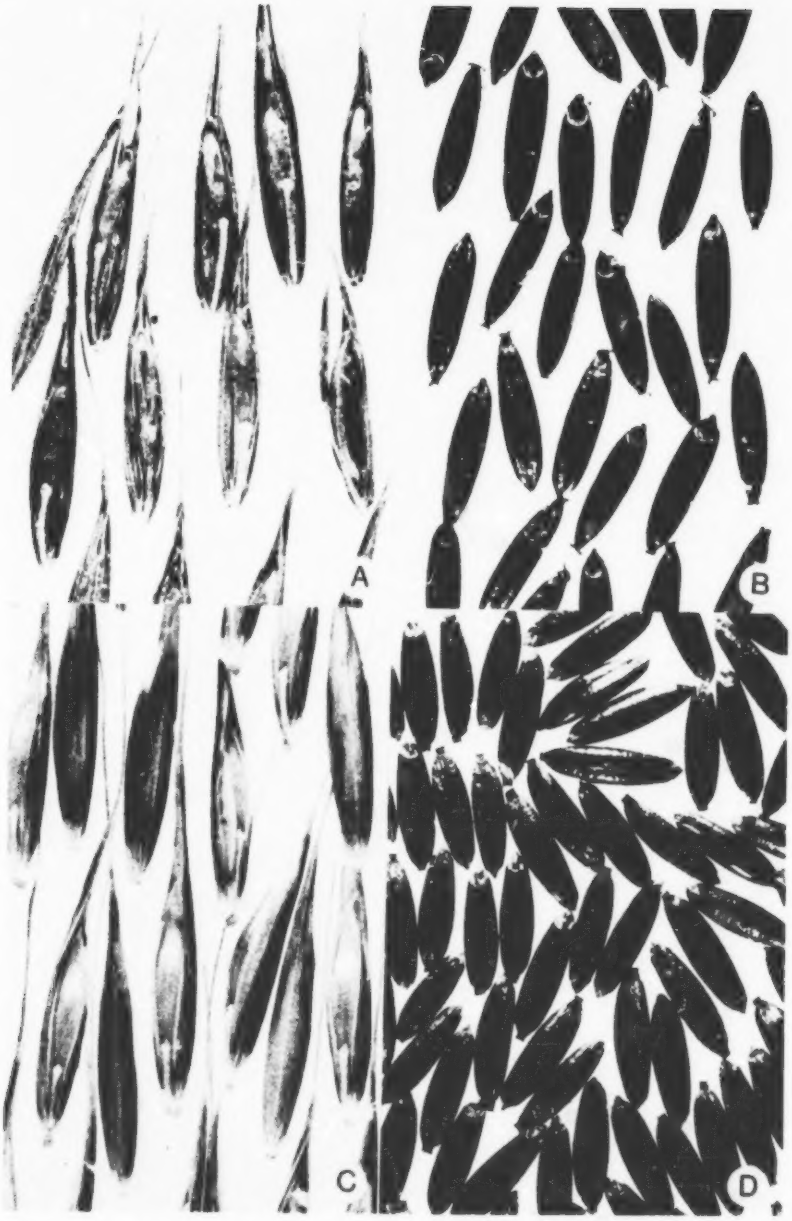


Plate 23. *A*, Florets of *Melica smithii* (Dore 24530); *B*, Caryopses of *M. smithii* (Dore 24530); *C*, Florets of *Schizachne purpurascens* var. *pubescens* (Dore 22133); *D*, Caryopses of *S. purpurascens* var. *pubescens* (Dore 22133).

18. Schizachne Hackel

Tufted, loosely rooted perennials. Foliage hairless or upper surface of blades sparsely pilose; sheaths often purplish, closed to the top; ligule membranous and completely sheathing the culm. Panicles few-spikeleted, long-exerted and arching, open to contracted. Spikelets several-flowered, the uppermost floret not producing a grain. Glumes usually purple. Lemmas rounded on the back, distinctly many-nerved, long-awned from between the 2 terminal membranous teeth; callus with a ring of straight hairs. Palea with dense fringes of curved hairs on the submarginal keels.

1. *Schizachne purpurascens* (Torrey) Swallen

Plate 23, Maps 85 and 86

false melic grass, purple melic grass

An early flowering grass of dry, usually rocky woodlands in both limestone and igneous areas, *Schizachne purpurascens* is widely distributed across Canada from Newfoundland and Labrador to interior British Columbia. It is more characteristic of the boreal forest than of other formations. The plant produces golden brown grains of substantial size (about 4 mm long) that, at maturity, thresh out easily from the florets. This suggests a potential as a special cereal like wild-rice.

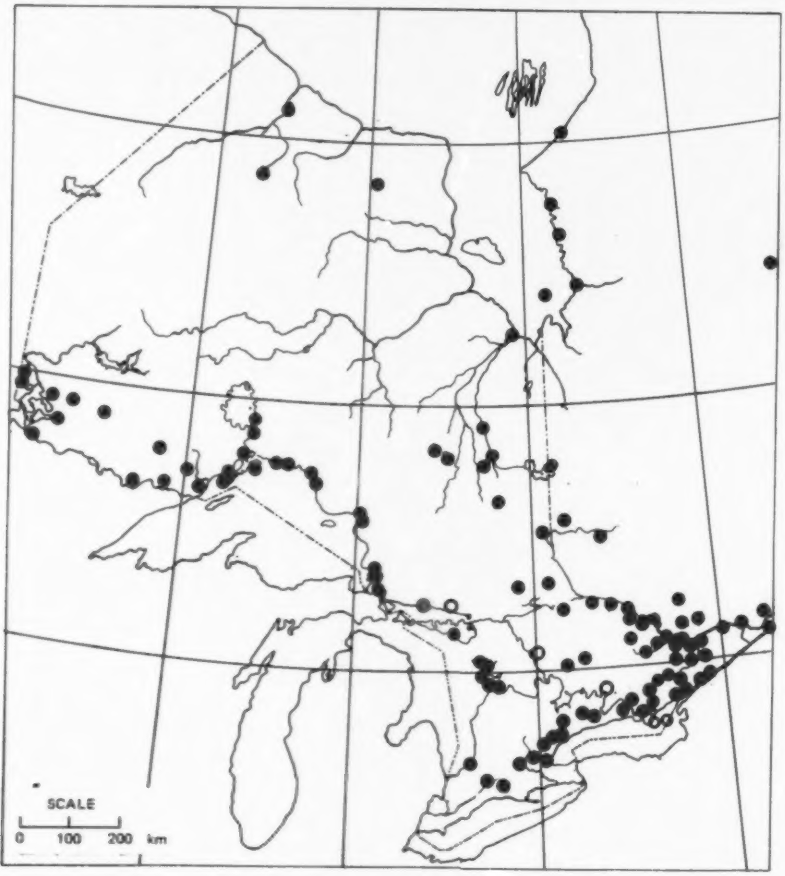
According to Koyama and Kawano (1964), *S. purpurascens* is represented in eastern Asia by subsp. *callosa* (Turcz.) T. Koyama & Kawano; the North American populations are then referable to subsp. *purpurascens*. This subspecies includes two variants differing in leaf pubescence and geographic distribution, which are recognizable as varieties.

Upper surface of the leaf blades glabrous	a. var. ***purpurascens***
Upper surface of the leaf blades sparsely pilose	b. var. ***pubescens***

1a. var. *purpurascens*

Var. *purpurascens* is the more widespread variety lacking fine hairs on the upper surface of the blades. In Ontario it is abundant over a large portion of the province, but seems to be absent from some of the eastern counties of the Ottawa–St. Lawrence lowland, from the Niagara Region, the area bordering Lakes Erie and St. Clair, and also from the upland areas south of Bruce Peninsula. Despite the lack of records, this variety is probably continuous across the northern forested area of the province, although rare in the far north.

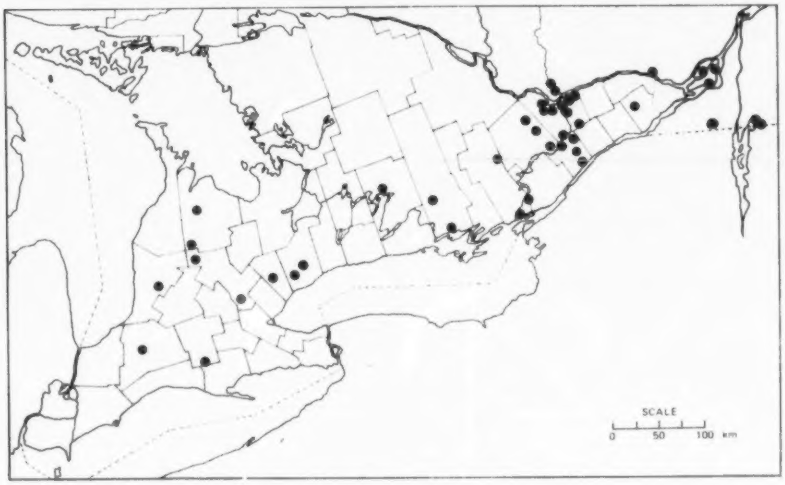
The distinctive reddish purple color of the glumes of *S. purpurascens* tends to fade to a pale straw color on maturity, making it difficult then to detect albino plants that have been described as f. *albicans* Fernald. Such plants also lack the purple coloration in their basal sheaths. One Ontario collection, from Joe Lake, Algonquin Park, is of this form.



Map 85. *Schizachne purpurascens* var. *purpurascens*. All known Canadian records from the area covered by the map are plotted.

1b. var. *pubescens* Dore

The hairs on the blades of var. *pubescens* are soft, white, 0.3–0.5 mm long, and arise from the veins on the upper surface. The hairs, which average about 10/mm², become flexuous on drying. Ordinarily such sparse and short pilosity would not be noticed, but, when the blades are held up to the light in the field, the hairs can be detected quite easily by the naked eye or with a hand-lens; in dry specimens the blades have to be unrolled to see the hairs. The leaf sheaths are also generally retrorse-hispidulous.



Map 86. *Schizachne purpurascens* var. *pubescens*. All known Canadian records from the area covered by the map are plotted.

As noted in McNeill and Dore (1977) all the known populations of this variety are in eastern North America, concentrated in southern Quebec and eastern and southern Ontario. In Ontario, var. *pubescens* makes up about half the population in the eastern counties, but in the central counties farther west it seems to be the only variant represented.

19. Tridens Roemer & Schultes (*Triodia* R. Br. p.p.)

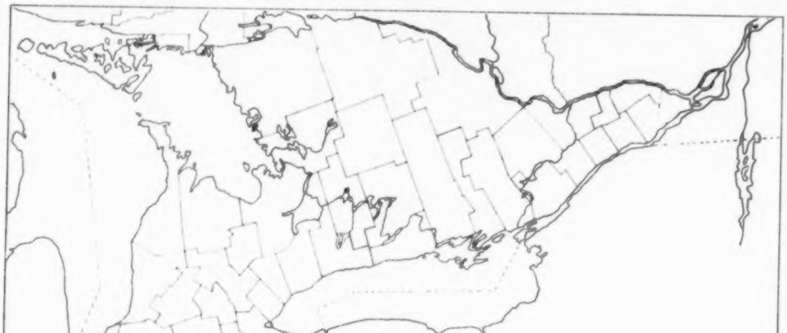
Erect, tufted perennial grasses with flat leaf-blades. Leaves glabrous, except at the junction of the sheath and blade; ligule a row of short hairs. Panicle lax, with several ascending branches bearing numerous spikelets in the upper part. Spikelets several-flowered, disarticulating above the glumes and between the florets. Glumes subequal, membranous, 1-nerved. Lemma rounded on the back, 3-nerved, bilobed, the mid-nerve and often also the lateral nerves excurrent as short awns; nerves all densely pubescent below. Palea strongly 2-nerved; nerves submarginal, scabrid.

1. *Tridens flavus* (L.) A. S. Hitchc. (*Triodia flava* (L.) Smyth)

Map 87

purpletop, tall redtop

A tall, tufted perennial grass of old fields and open woods in the eastern United States, *Tridens flavus* was discovered for the first time in Canada in 1976. It was growing in dry cinders and gravelly soil along a railway track near Niagara Falls (Catling et al. 1978).



Map 87. *Tridens flavus.*

20. Triplasis Beauv.

Annuals with coarse-jointed stems. Leaf blades short, firm, often inrolled; sheaths hairy at the collar; ligule a row of hairs. Inflorescence of small terminal panicles and narrow lateral cleistogamous ones hidden in the leaf sheaths. Terminal panicle up to 5 cm long with 2–4 spreading, few-spikeleted branches. Spikelets 2- to 4-flowered, red purple, wedge-shaped. Glumes smooth, with midnerve only. Lemmas 2-lobed at the tip; the midnerve sometimes extending into a point as long as the lobes; callus and 3 nerves densely pubescent. Palea silkenly pubescent along its 2 nerves, especially above the middle. Lateral panicles represented by 1–3 naked florets, completely enclosed in inflated sheaths.

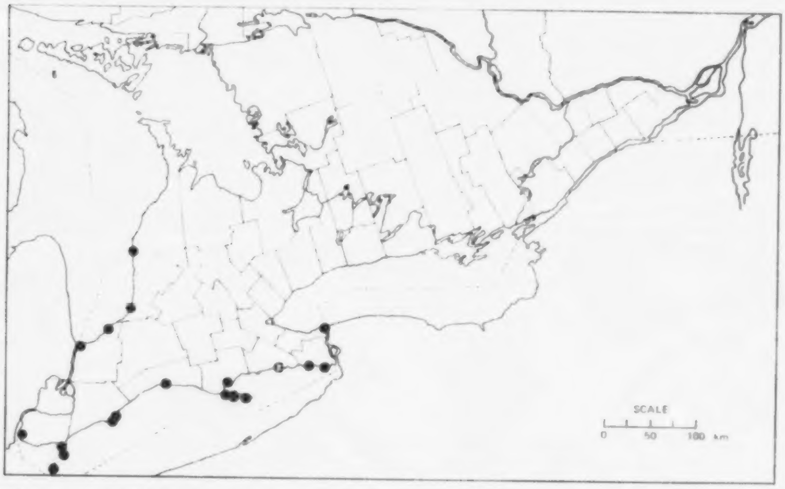
1. *Triplasis purpurea* (Walter) Chapman

Plate 24, Map 88

sand grass

Triplasis purpurea is characteristically found on the hot sand of lake beaches where few other plants can survive. It is known at most sandy places along Lake Erie, particularly Point Abino, Port Colborne, Long Point, Port Stanley, Rondeau, Point Pelee, Pelee Island, and Amherstberg. It is not so plentiful on the beaches of Lake Huron where it is found only in Lambton County at Sarnia and Justin Grove, and in Huron County at St. Joseph and Port Albert. It is apparently lacking along Lake Ontario shores except for an occurrence at Niagara-on-the-Lake, although there is a specimen ambiguously labeled "shore of bay south of L. Ontario," that has subsequently been anonymously annotated "near Grimsby" and plotted as such by Soper (1962, p. 8). According to Smith (1965), *T. purpurea* is not known along the south shore of Lake Ontario in New York State.

The plants are very small and inconspicuous until midsummer. In the late fall the stems break up into fragments just below the nodes and these segments with their mature grains enclosed are then scattered by the wind to become buried in the sand. As a consequence the seedlings are usually found in crowded clusters. Although naturally confined to exposed beaches, there is evidence that the species may eventually spread more widely to disturbed land, particularly if it is sandy. In 1957 plants were found a few kilometres from the shore at Turkey Point, Norfolk County, growing more vigorously in the furrows of a forestry firebreak, than on the beach.



Map 88. *Triplasis purpurea.*

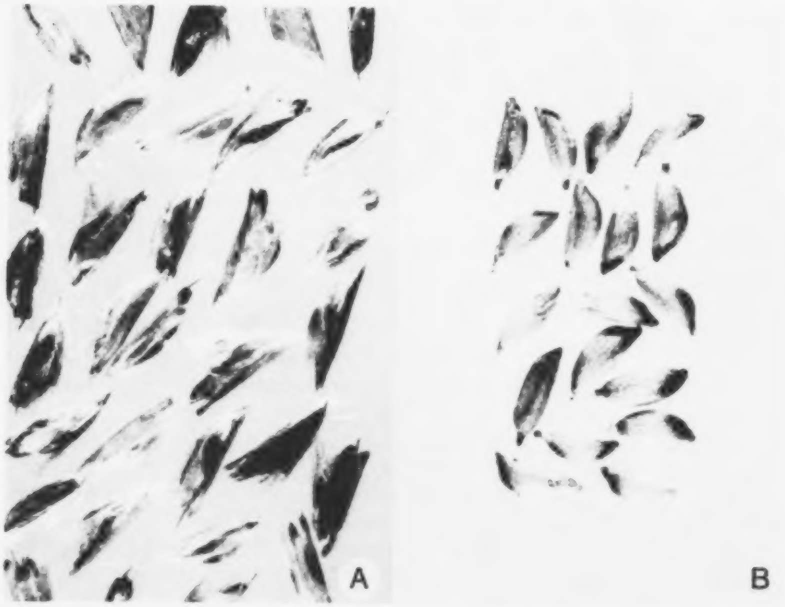


Plate 24. *A*, Caryopses of *Triplasis purpurea* (Phipps 3510); *B*, Caryopses of *T. purpurea* (Phipps 3510).

21. Agropyron Gaertner

Rhizomatous or tufted perennials. Leaf-blades generally hairless, but sometimes sparsely pilose; sheaths open, often with auricles at the top; ligule short, tough-membranous. Spikelets arranged singly at the nodes of the rachis, 3- to 7-flowered. Glumes flat, firm, rounded on the back, positioned laterally or turned slightly to the front. Lemmas firm, rounded on the back, sharp-pointed or long-awned.

The genus, as represented in Canada, was revised by Bowden (1965), on the basis of morphological and cytological studies. The delimitation of *Agropyron*, *Elymus* and segregate genera such as *Elytrigia* and *Leymus* has long been problematical and various realignments have been proposed (cf. Runemark & Heneen 1968; Tsvelev 1973*a*, 1976). As no satisfactory reexamination of generic limits had been published when the account was in preparation the traditional delimitation was retained. Dewey's (in press) synthesis of genome analysis data suggests, however, that an acceptable realignment of generic limit is now possible. Names that might then be adopted for the species occurring in Ontario are given as synonyms.

A. Rhizomes long, the plants spreading; spikelets finally falling away completely leaving a naked rachis at maturity; anthers 3 mm or more long

  B. Blades flat, soft, lax, fine-veined; plants generally green but sometimes glaucous; introduced from the Old World .... 1. ***A. repens***

  B. Blades generally involute, hard, rigid, heavily ridged above; plants glaucous

    C. Glumes rigid, very slenderly taper-pointed from near base, unilateral, and generally curved to the side; lemmas glabrous or scabrous (finely pubescent in var. *molle*); introduced from western North America .... 2. ***A. smithii***

    C. Glumes less firm, taper-pointed in upper one-quarter, nearly equilateral, and almost straight; lemmas densely pubescent

      D. Plants usually 30–60 cm high; spikes 5–11 cm long; glume joint and rachis below it hairless; plants glaucous; introduced from western North America .... 3. ***A. dasystachyum***

      D. Plants usually 50–90 cm high; spikes usually 8–15 cm long; glume joint and rachis below it hairy; plants pruinose; sandy shore of Lake Huron; native .... 4. ***A. psammophilum***

A. Rhizomes absent, the plants tufted; spikelets disarticulating above the glumes, which remain on the rachis at maturity

  E. Spikes broad, flat, the spikelets crowded (mid-internodes of rachis 1–2 mm long) and spreading widely from the rachis; anthers 3–5 mm long; introduced from Asia; established very locally .... 7. ***A. pectiniforme***

- E. Spikes cylindrical; spikelets scarcely crowded (mid-internodes of rachis 4–11 mm long), closely appressed to the rachis
  - F. Spikes rather dense, the mid-internodes of the rachis 4–5 mm long; lemmas usually shortly pubescent, at least in the lower part; glumes markedly asymmetric with broad scarious margins, widening upwards, 0.5–1 mm wide; anthers 1–2 mm long; native in extreme north .... 6. ***A. violaceum***
  - F. Spikes slender, elongate, the mid-internodes of the rachis 8–11 mm long; lemmas glabrous to scabrid; glumes ± symmetric, with ± equally narrow scarious margins, 0.1–0.6 mm wide
    - G. Glumes clearly 3-nerved; anthers 2–3 mm long; European; experimentally cultivated, not naturalized .... ***A. caninum*** (p. 189)
    - G. Glumes 5- to 7-nerved; anthers 1–1.5 mm long; native .... 5. ***A. trachycaulum***

1. *Agropyron repens* (L.) Beauv. (*Elytrigia repens* (L.) Nevski)

Fig. 9, Plate 25, Map 89

couch grass, quack grass

Although of considerable forage value when abundant in hayfields and pastures, *Agropyron repens* is looked upon as one of our worst weeds when it infests arable land. Because of its vigorous growth by long tough rhizomes, it resists cultivation and persists in plowed fields, spreading rapidly and offering serious competition to sown crops. The rhizome tips are sufficiently sharp-pointed to grow through tubers of potatoes. Portions of the rhizomes, inevitably delivered in the topsoil for new lawns and gardens, are a major complaint of landscape gardeners. In old pastures, and in lawns and fields with established sod, the leaves are often obscure and the plant seems to be an insignificant component of the vegetation. After the sod is broken, however, rapid growth occurs from the rhizomes.

In the southern part of the province couch grass is also abundant along road embankments, in vacant lots, and in waste places, and it even grows well on deep sand dunes. In all these sites it has some utility in covering over the soil and thus restricting blowing or washing. It seems to have entered the country with the first settlers, along with *Poa annua*, *Poa pratensis*, *Phleum pratense*, and numerous other alien grasses, which did not persist so well. The early floristic lists of the 1860s already refer to *A. repens* as "common," "very common," or "too common." In the northernmost part of the province, Dutilly and Lepage (1963) say that it is found around every inhabited place in the area south of James Bay. The most northern records are from Moosonee and Lake Attawapiskat.

Considerable variation is exhibited in the habit of growth, size of inflorescence, shape of glumes, awning of lemmas, and pubescence and glaucescence of foliage. Numerous variants have been given infraspecific

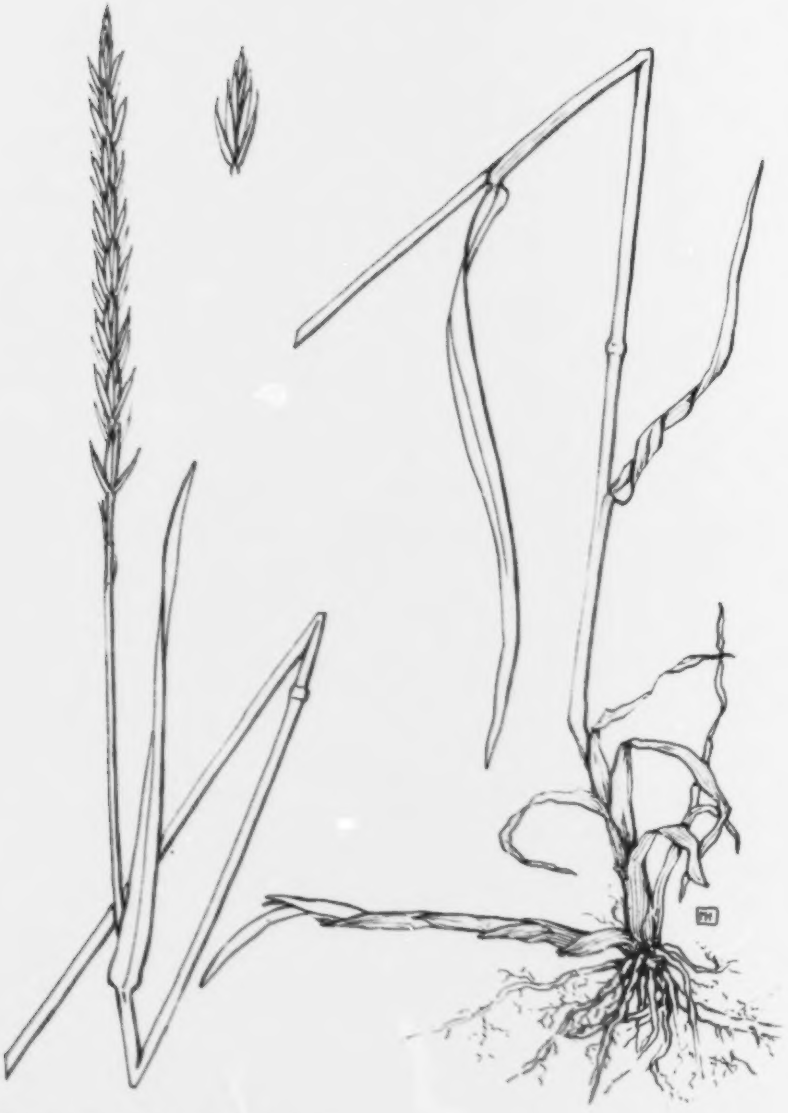
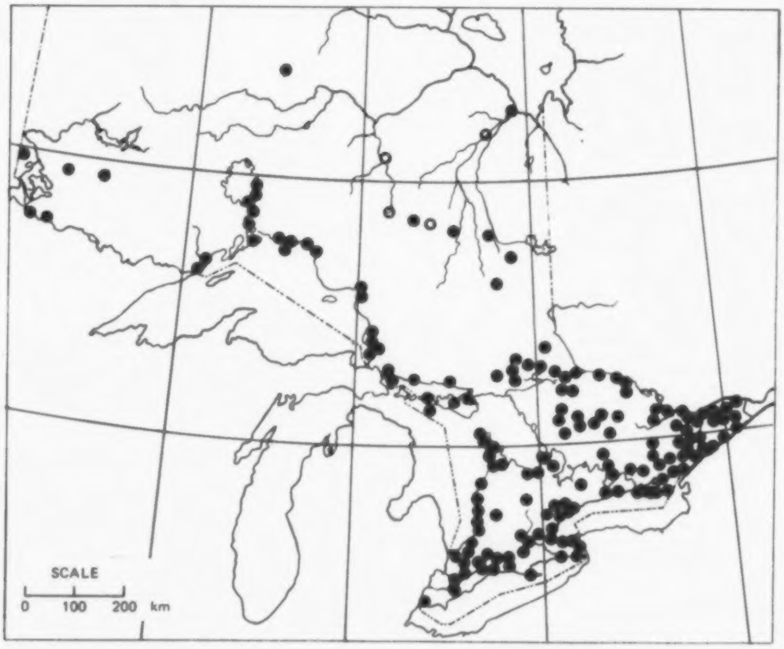


Fig. 9. *Agropyron repens* (L.) Beauv.

names by European and American botanists (Fernald 1933*a*), but because their features occur in all combinations and show no relationship to habitat or weediness, their recognition would appear to be of little practical or systematic importance. The numerous variants examined by Bowden (1965) all had the usual somatic chromosome number, $2n = 42$.



Map 89. *Agropyron repens.*

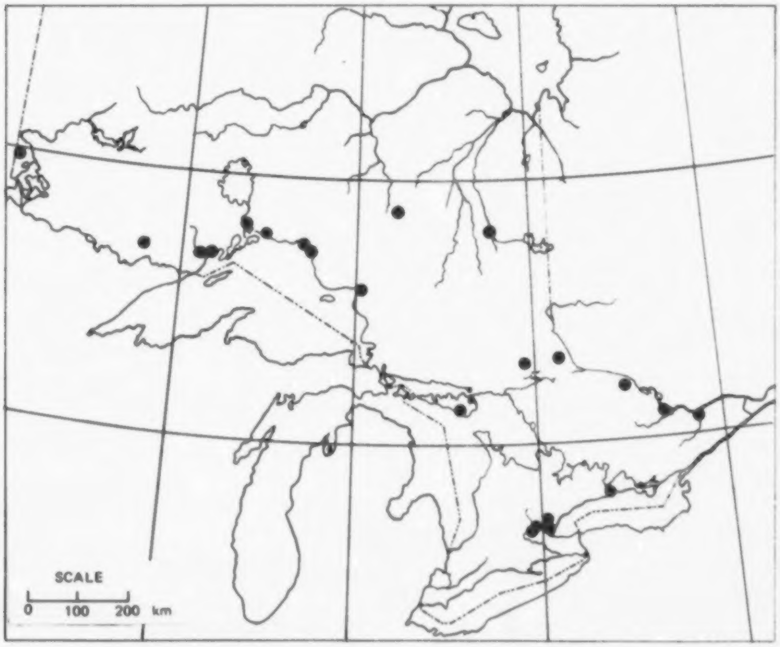
2. *Agropyron smithii* Rydb. (*Elytrigia smithii* (Rydb.) A. Löve;

Plate 25, Map 90

bluestem wheat grass, western wheat grass

Agropyron smithii is a common native species of considerable forage importance in the southern Prairie Provinces. Most Ontario records are introductions from the west and seem to have appeared since its settlement. This is indicated by the widespread occurrence of the species on railroads, railroad embankments, and yards.

The localized occurrences on an ancient beach deposit near Thunder Bay and in association with other prairie species on Manitoulin Island may be interpreted as natural, perhaps as relicts of a former wider distribution.



Map 90. *Agropyron smithii.*

Dodge (1915) has reported it in Lambton County as "occasional in towns, villages, and along railways. Easily recognized by its bluish green leaves," but he was undoubtedly confused by glaucous forms of *A. repens.* No specimens of *A. smithii* have yet been collected in that part of the province.

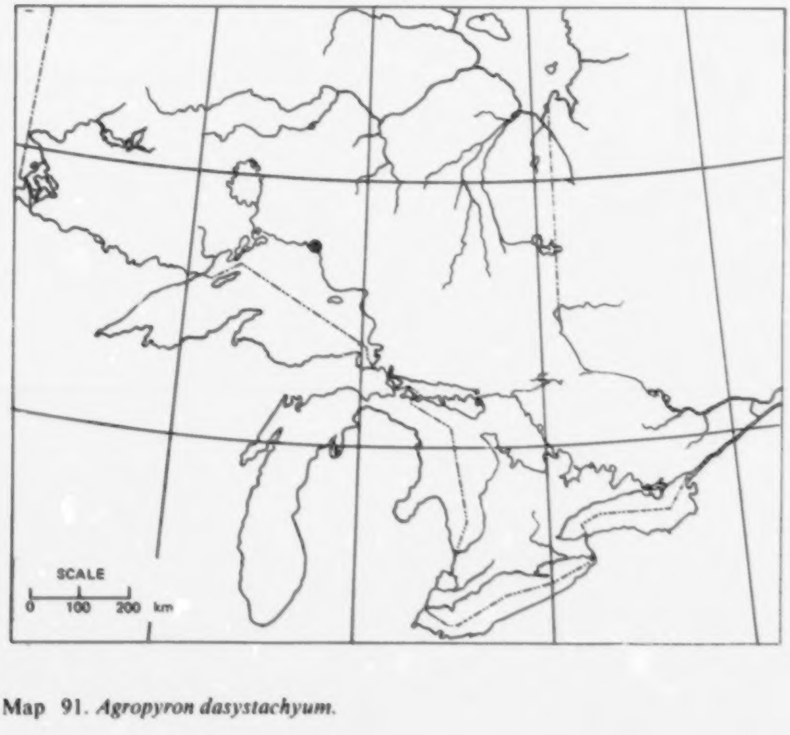
Plants with pubescent lemmas, which have been called f. *molle* (Scribner & J. G. Sm.) J. M. Gillett & H. A. Senn (1960), occur along with typical glabrous plants (f. *smithii*) at Hearst and at Chalk River, where many western horses were assembled during the First World War for use overseas, and prairie hay must have been brought along to feed them. Both forms have the same chromosome number, $2n = 56$ (Bowden 1965).

3. *Agropyron dasystachyum* (Hooker) Scribner (*Elymus lanceolatus* (Scribner & J. G. Sm.) Gould; *Elytrigia dasystachya* (Hooker) A. & D. Löve)

Map 91

northern wheat grass

A species of widespread distribution in the Prairie Provinces, *Agropyron dasystachyum* is known in Ontario only as an introduction along the railroad at Coldwell, Thunder Bay District. Dodge (1914) reported it from sandy ground near the shore at Point Pelee, a record that is likely to be erroneous. Certainly, no specimens have been found for corroboration. Dodge also reported it in his Lambton County list (1915) as "occasional on sand along the Lake Huron shore; a good sand-binder." The specimen on which this is probably based comes from the Michigan side of the lake at Port Huron and was selected as the type of *A. psammophilum* f. *aristatum* J. M. Gillett & H. A. Senn, a variant not known in Ontario.



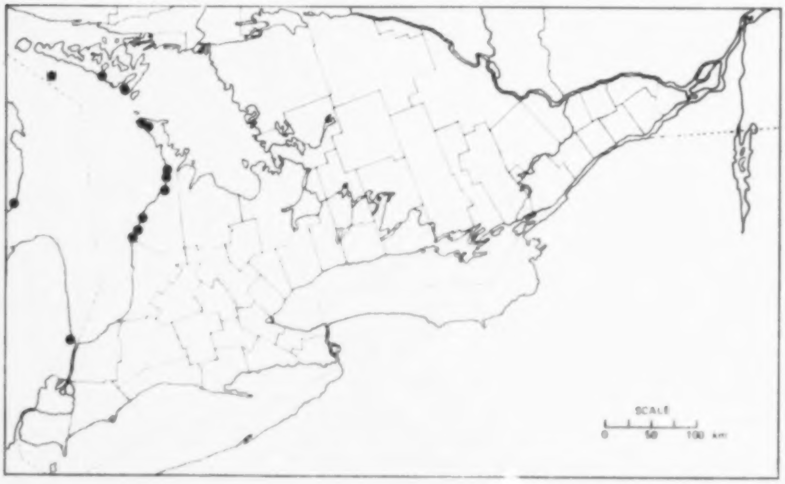
Map 91. *Agropyron dasystachyum.*

4. *Agropyron psammophilum* J. M. Gillett & H. A. Senn (*Agropyron dasystachyum* var. *psammophilum* (J. M. Gillett & H. A. Senn) E. G. Voss; *Elymus lanceolatus* subsp. *psammophilus* (J. M. Gillett & H. A. Senn) A. Löve)

Plate 25, Map 92

Great Lakes wheat grass

The total distribution of *Agropyron psammophilum* as plotted by its authors (Gillett and Senn 1961) is limited to the shores of Lake Michigan and Lake Huron. It is the characteristic grass of the dunes at Clark Point at the southern boundary of Bruce County and of the dry shore sands as far to the northward as Dorcas Bay at the tip of the Bruce Peninsula; its distribution continues across Lake Huron to Manitoulin Island and Great Duck Island. It has a somatic chromosome number of $2n = 28$ (Bowden 1965).



Map 92. *Agropyron psammophilum.* All authenticated records from the area covered by the map are plotted.

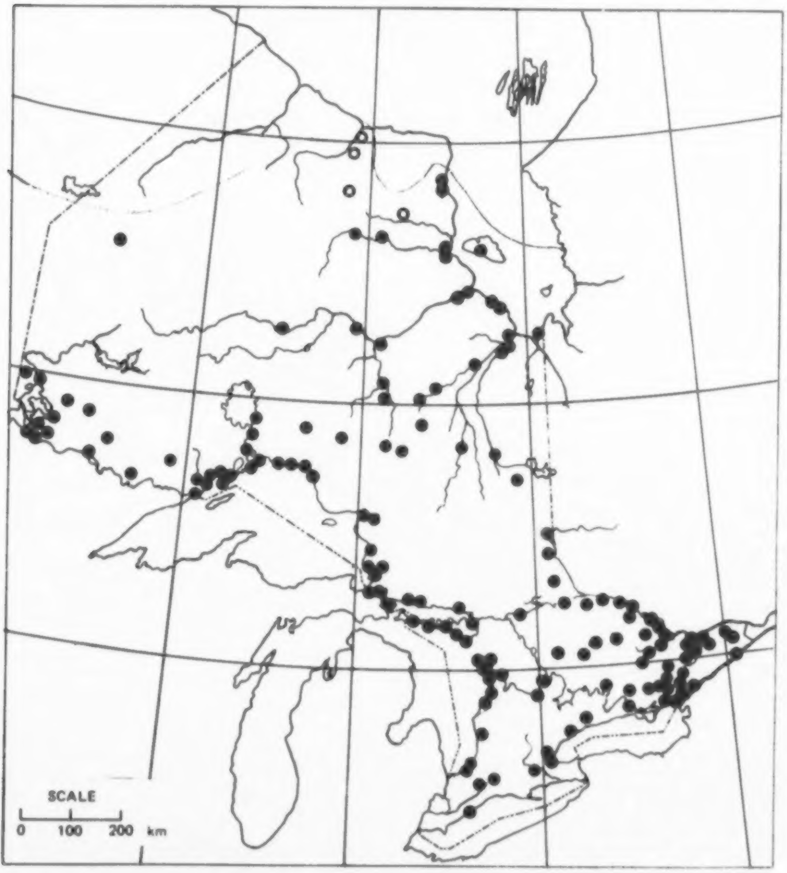
A hybrid between this species and *A. trachycaulum* is known from Dorcas Bay and Providence Bay, where both parental species occur. It is intermediate in morphology, grows at the ecotone between the sand dunes and the woods (the respective habitats of the parents), and is completely sterile. One specimen from Dorcas Bay is highly infested and grotesquely deformed by gall-forming insects (Gillett and Senn 1961).

5. *Agropyron trachycaulum* (Link) Malte ex H. F. Lewis (*Elymus trachycaulus* (Link) Gould ex Shinners)

Plate 26, Map 93

wheat grass

Agropyron trachycaulum is a polymorphic species to which much study has been given (Malte 1932, Fernald 1933*a*). However, our understanding of its variation and possible infraspecific taxa remains imperfect, perhaps because of the intergradation of characters resulting from the occasional outcrossing within this predominantly self-pollinated complex. In recent years the name *A. pauciflorum* (Schweinf.) A. S. Hitchc., has been mistakenly applied to this species (cf. McNeill and Dore 1977).



Map 93. *Agropyron trachycaulum* (all varieties).

It is a grass most characteristic of the boreal forest region. When all variants are plotted on a single map, the pattern of distribution obtained corresponds well with the localities in the province that have been well botanized. The one exception is the central upland of southernmost Ontario where all variants are rare, and apparently absent from most of the area. The plant still occurs in the wooded sand dunes near Port Franks on Lake Huron, but from London and Strathroy only old specimens, antedating 1900, are known.

The species is easily destroyed by cultivation or prolonged grazing and this feature explains its absence today from the fenced land in the farming regions of the province. It persists well on open rocky outcrops, both igneous and calcareous, and consequently it is still a prominent grass of the Canadian Shield, the Frontenac Axis, along northern Lake Superior, and in the Kenora District, as well as on limestone flats in the Ottawa Valley, the Trent Valley, the Bruce Peninsula, and Manitoulin Island. In the far north it is confined, however, to sites where well-drained soils are to be found, such as the high banks of the major rivers and of James Bay and Hudson Bay.

The following is a tentative treatment of the infraspecific variation met with in Ontario. The varieties recognized exhibit some geographical pattern, but the details of distribution are not yet fully worked out.

- A. Awns very short to less than half as long as the lemma
    - B. Glumes less than 10 mm long; spikelets densely imbricate, exceeding the base of the next spikelet on that side of the rachis; rachis joints less than 0.6 mm thick, not flanged at the top .... c. var. ***novae-angliae***
    - B. Glumes more than 10 mm long; spikelets scarcely imbricate, not extending to the base of the next spikelet on that side of the rachis
        - C. Spikes slender, usually less than 5 mm wide; rachis joints usually less than 0.7 mm thick, not flanged .... a. var. ***trachycaulum***
        - C. Spikes robust, usually more than 5 mm wide; rachis joints usually more than 0.8 mm thick, flanged at the top .... b. var. ***majus***
- A. Awns more than half as long as the lemma
    - D. Awns straight, much longer than the lemma; spikelets somewhat secund, on a slightly curved rachis; the awns forming a "brush" along one side of the spike; glumes usually more than 10 mm long .... d. var. ***unilaterale***
    - D. Awns somewhat undulate, one-half to one and a half times as long as the lemma; spikelets distinctly arranged on both sides of the straight rachis; glumes usually less than 10 mm long .... e. var. ***glaucum***

5a. var. *trachycaulum*

slender wheat grass

Var. ***trachycaulum*** is the characteristic slender wheat grass of the prairies. In Ontario it is common in the Rainy River and Kenora districts but it is not native elsewhere; it is known as an introduction with highway verge sowings at Arnprior, Renfrew County. The foliage is always hairless.

5b. var. *majus* (Vasey) Fernald (*Elymus trachycaulus* subsp. *major* (Vasey) Tsvelev)

Var. *majus* consists of taller and coarser plants than var. *trachycaulum* and includes some specimens that Fernald (1933*a*) would refer to the typical variety. It is known along the north shore of Lake Superior and at Chalk River, Renfrew County. These plants are included by Bowden (1965) in var. *trachycaulum*.

5c. var. *novae-angliae* (Scribner) Fernald (*A. trachycaulum* var. *ciliatum* (Scribner & J. G. Sm.) Gleason, non var. *ciliatum* (Scribner & J. G. Sm.) Malte; *Elymus trachycaulus* subsp. *novae-angliae* (Scribner) Tsvelev)

Within Ontario this group of more slender plants is found in the Ottawa Valley, the Bruce Peninsula, along the north shore of Lake Superior, and northward to James Bay.

5d. var. *unilaterale* (Cassidy) Malte (*A. subsecundum* (Link) A. S. Hitchc.; *Elymus trachycaulus* subsp. *subsecundus* (Link) A. & D. Löve)

bearded wheat grass

The plants of var. *unilaterale*, treated as a distinct species by Hitchcock and Chase (1951), usually have glabrous foliage and green spikelets. These plants (f. *unilaterale*) are scattered across the province at Alexandria, Glengarry County, Erinsville, Lennox and Addington County, Chippewa Hill, near Southampton, Bruce County, Heron Bay, Thunder Bay District, and Ingolf, Kenora District.

Plants from the dunes on the shore of Lake Huron at Southampton, Bruce County, have spikelets suffused with purple. Another more widespread variant is that in which the middle and lower leaf sheaths are densely pilose and the lower leaf blades are often also pilose on both surfaces. These plants can be referred to f. *ciliatum* (Scribner & J. G. Sm.) Dore. They are found on limestone flats along the Trent River and on Lemieux Island, Ottawa, in sandy woods at Pontypool, Durham County, and in a bog meadow at Alfred Station, Prescott County.

5e. var. *glaucum* (Pease & A. H. Moore) Malte

The rather inappropriately named var. *glaucum* is much more common in Ontario than var. *unilaterale* and is also distributed across the central and southern part of the province from the Ottawa Valley through the

Rideau Lakes and Muskoka regions to Galt (Cambridge), Port Franks, Lambton County, and Ingolf, Kenora District on the western border of Ontario. The foliage is usually green and glabrous, although specimens with pilose leaf sheaths and blades are known, but from outside the province (e.g., Aylmer, Que.).

Agropyron caninum **(L.) Beauv. (*Elymus caninus* (L.) L.)**—This is a common species of northern Europe, similar to some variants of *A. trachycaulum*, but not known to grow in Ontario outside of experimental plots such as those at the Ontario Agricultural College, Guelph, and the Central Experimental Farm, Ottawa. Many specimens collected before 1932, the date of Malte's study of the complex, are, however, misidentified under this name.

6. *Agropyron violaceum* (Hornem.) Lange (*Elymus trachycaulus* subsp. *violaceus* (Hornem.) A. & D. Löve; *Agropyron latiglume* (Scribner & J. G. Sm.) Rydb.)

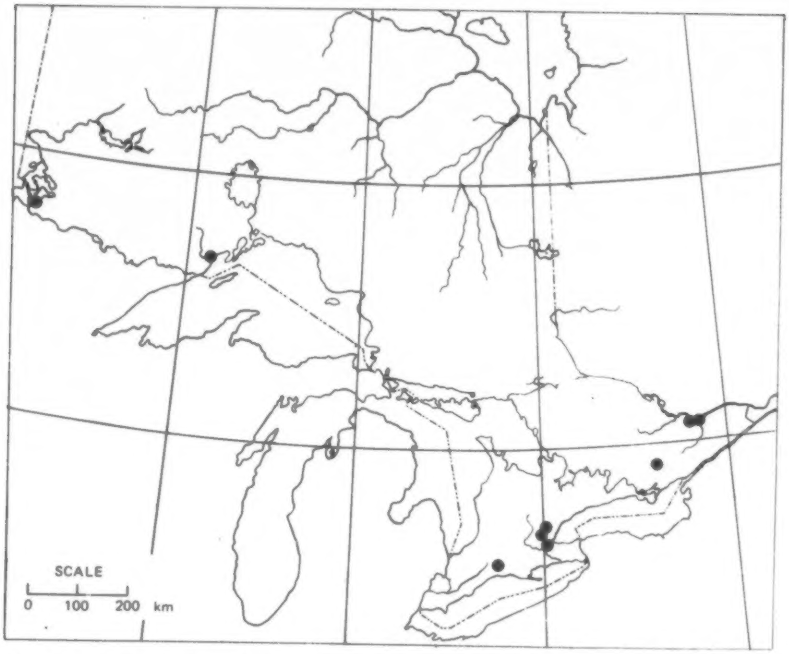
An arctic and Rocky Mountain species, long known in northern Quebec, *Agropyron violaceum* was reported by Moir (1958) as occurring in the Fort Severn area of Ontario's Hudson Bay coast. Although no authenticating specimens of this record have been traced, the species was collected at Winisk in 1976 by J. L. Riley. The overall distribution of the species suggests that it may occur elsewhere in the northernmost parts of Ontario. The Ontario material would be referred to *A. boreale* (Turcz.) Drobov subsp. *boreale* in Melderis's treatment of *Agropyron* in Hultén (1967, 1968).

7. *Agropyron pectiniforme* Roemer & Schultes (*A. cristatum* auct. amer., non (L.) Gaertner)

Plate 26, Map 94

crested wheat grass

Agropyron pectiniforme is used extensively as a forage grass in the Prairie Provinces, where it is invaluable in those portions too arid for the ordinary meadow and pasture grasses. In Ontario it occurs only where it has been planted experimentally or intentionally along highways; at these places it sometimes establishes by chance in lawns and fields. Specimens from plantings since 1936 are known from the Ottawa area, Arden, Frontenac County, Hamilton, Guelph, Freelton, Regional Municipality of Hamilton-Wentworth, St. Thomas, Thunder Bay, and Rainy River. At these places it seems to persist well but shows no evidence of spreading widely. The species was formerly included in *A. cristatum* (L.) Gaertner and still sometimes appears under that name.



Map 94. *Agropyron pectiniforme.*

Plants from the Ottawa area have a somatic chromosome number of $2n = 14$ (Bowden 1965), the usual number in the species, although tetraploid and hexaploid plants are known elsewhere.

Agropyron desertorum **(Fischer ex Link) Schultes (*A. sibiricum* auct. amer., non (Willd.) Beauv.)** —This species has less widely divergent spikelets and the internodes of the rachis are 2.5–3.5 mm long (not 1–2 mm). It is also an introduction to North America from Asia and may possibly be found in Ontario.

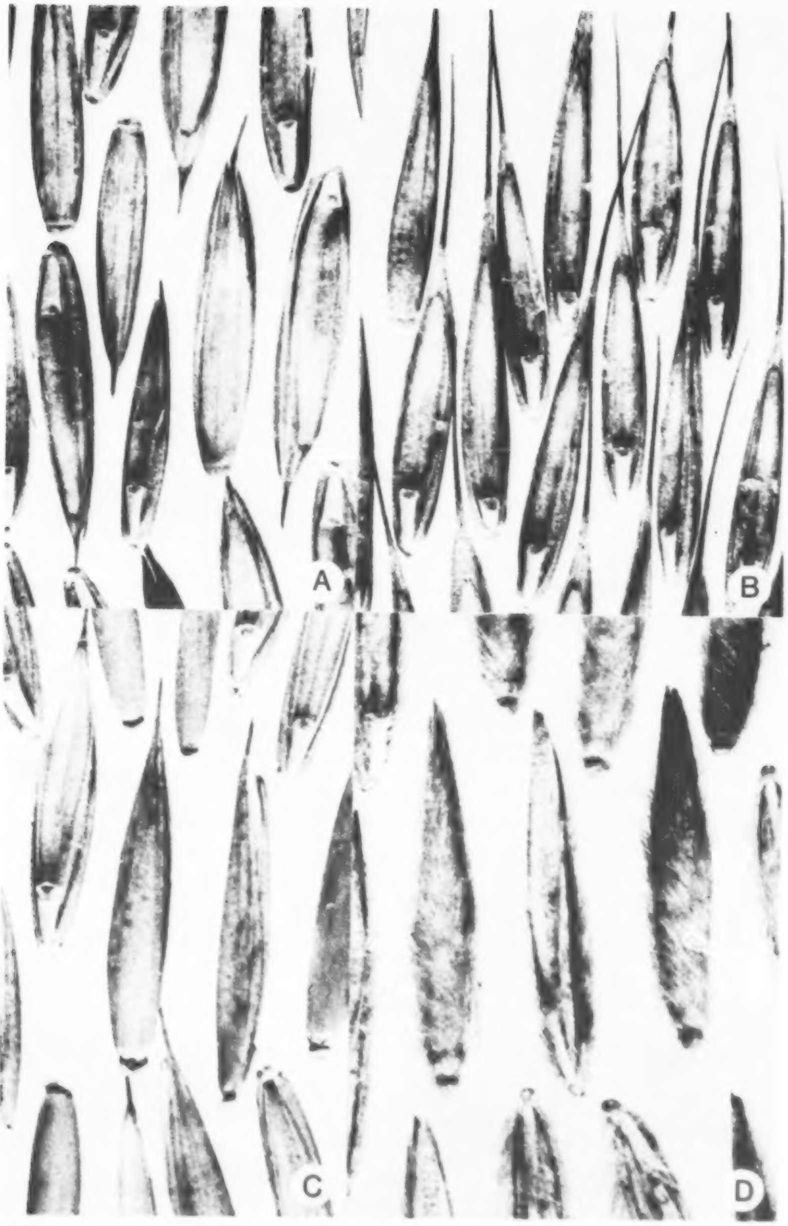


Plate 25. *A*, Shortly awned or awnless florets of *Agropyron repens* (Senn 6128A); *B*, Long-awned florets of *A. repens* (Senn 6128B); *C*, Florets of *A. smithii* (Gillett and Bowden 7597); *D*, Florets of *A. psammophilum* (Senn 1102).

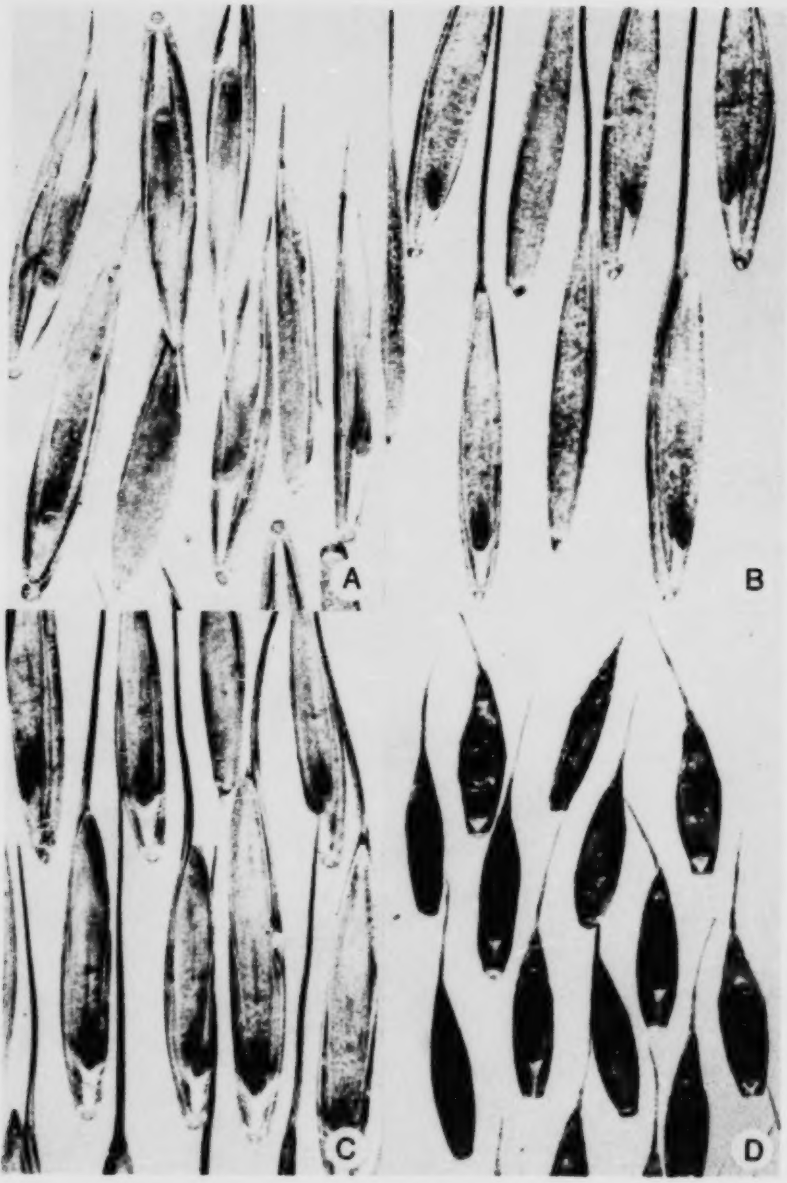


Plate 26. *A*, Florets of *Agropyron trachycaulum* var. *trachycaulum* (Dore 21211); *B*, Florets of *A. trachycaulum* var. *unilaterale* (Dore and Marchant 24163); *C*, Florets of *A. trachycaulum* var. *glaucum* (Dore and Brayshaw 21672); *D*, Florets of *A. pectiniforme* (Garton 9181).

22. Triticum L.

Annual grasses, often planted in autumn. Foliage hairless, or sometimes with sparse hairs on the lower leaves, usually glaucous; auricles present; ligule membranous, short, usually translucent. Spikes thick, of 2- to 4-flowered spikelets set singly at the nodes of the persistent axis. Glumes broad, cupped, short-beaked. Lemmas asymmetric, awnless or coarsely single-awned. Grain free from palea, with a short "brush" at top.

According to current concepts, two species of wheat are commercially grown in Ontario on a considerable scale (Bowden 1959, 1962). Stray plants spring up around farmyards, granaries and roadsides, but do not persist from year to year. Numerous cultivars of these important cereal grasses exist. Descriptions of some of these that are or have been grown in Canada can be found in, for example, Briggle and Reitz (1963), Peterson (1965), and Whiteside and Gfeller (1958).

Spikelets crowded, closely imbricate without any space between adjacent spikelets on the same side of the rachis; spike tending to taper toward the apex; lemma long-awned .... 1. ***T. turgidum***

Spikelets not usually crowded, with a conspicuous space between adjacent spikelets on the same side of the rachis; spike of uniform thickness; lemmas awnless to shortly awned, rarely long-awned .... 2. ***T. aestivum***

1. *Triticum turgidum* L.

tetraploid wheat, including durum wheats and macaroni wheats

Triticum turgidum is grown as a spring-sown grain crop across the southern counties of Ontario. Its long-bearded varieties are preferred for dry bouquets for decorative purposes. It is not, however, often found as an escape.

The spikes are broader in side view than those of *T. aestivum* and the whole spike is rather short. *Triticum turgidum*, in the broad sense used here, represents tetraploid wheat ($2n = 28$) with the AB genome (Riley 1965). This includes wild races of southwest Asia such as wild emmer (referred to as *T. dicoccoides* Körnicke ex Schweinf.) and the primitive and ancient cultivated emmer (*T. dicoccum* Schrank), which probably represent stages in the evolutionary history of the modern cultivars of the group (*see* Zohary 1969, 1971).

2. *Triticum aestivum* L.

Plate 27

hexaploid wheat, common wheat or vulgare wheat, including bread wheats (hard red spring wheats) and pastry-flour wheats (soft winter or spring wheats)

Triticum aestivum is grown as winter wheat in the southwestern counties, mainly from Peterborough to Lambton; as such it is sown in early October and harvested in mid-July. Elsewhere in the province, cultivars of this species are grown as spring wheats sown in mid-May and harvested in August.

Hexaploid wheat ($2n = 42$) has the ABD genomic constitution, the AB being that of the *T. turgidum* group and the D contributed by hybridization with an *Aegilops* species, probably *A. squarrosa* L. No wild hexaploid wheat is known and it is thought to have arisen by hybridization involving already cultivated tetraploid wheat. This probably occurred many times, the earliest being over 8000 years ago, probably near the southwest corner of the Caspian Sea (Zohary 1971).

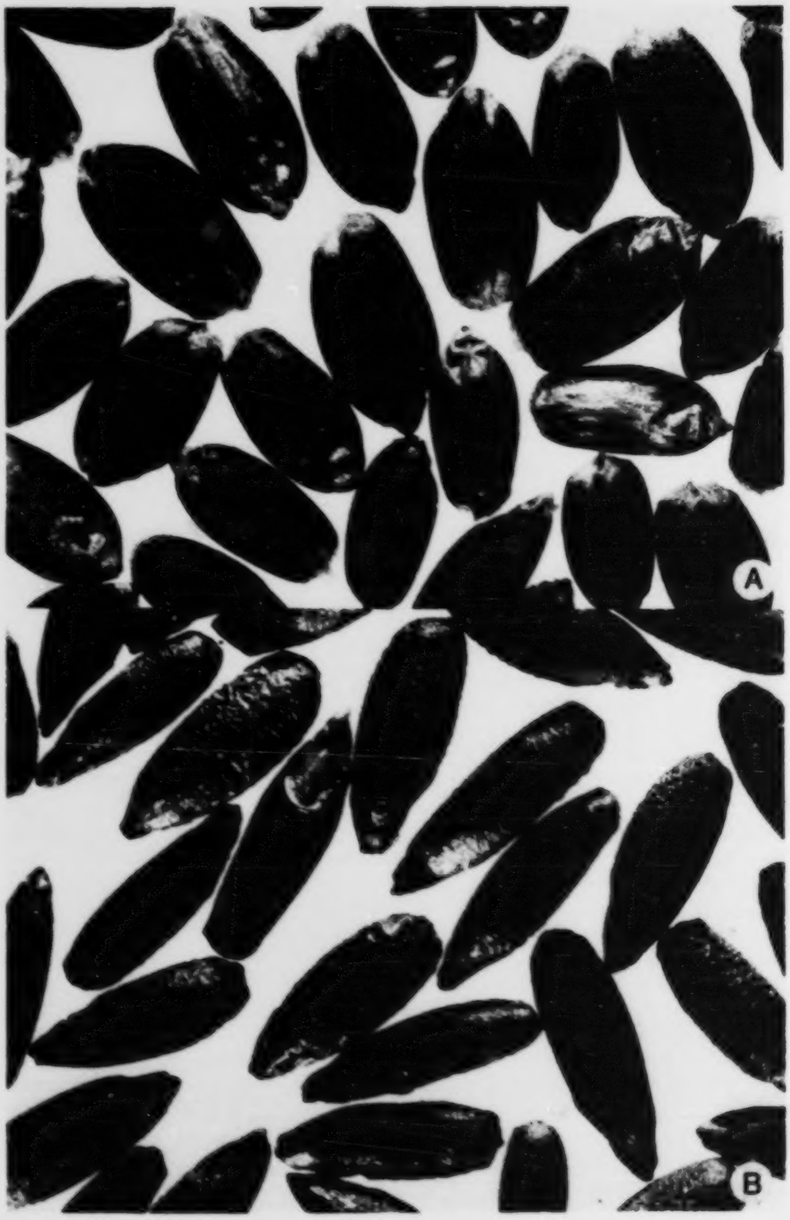


Plate 27. *A*, Caryopses of *Triticum aestivum* cv. Garnet (cultivated in Ottawa); *B*, Caryopses of *Secale cereale* (rye) cv. Antelope (cultivated in Ottawa).

23. Secale L.

Annual grasses, usually winter annuals, with tall stems, taller than in other cereals. Foliage hairless, glaucous, often purplish; auricles poorly developed; ligule membranous, short. Spikes thick, rather soft, composed of 2-flowered spikelets arranged singly at the nodes of a usually arching axis. Glumes slender, 1-nerved, awl-shaped, persistent on the axis. Lemmas strongly ciliate on margins and sharp keel, long-awned. Grain loose in the floret, dark brown, often wrinkled, hairy at top.

1. *Secale cereale* L.

Fig. 10, Plate 27

rye

Secale cereale is frequently cultivated in Ontario but not as extensively as barley, oats, and wheat. It is usually planted in summer or fall as a soil-improving crop and is regularly used in rotation with tobacco and plowed into the sandy soil in the southwestern counties. Plants of *S. cereale* are sometimes conspicuous along new highways where they are sown as a companion crop for the slower-establishing turf species, and sometimes volunteer sparsely in the succeeding year or two after cropping. When infected by a fungus (*Claviceps purpurea*), long black poisonous ergots become conspicuous in the heads.

Rye is thought to be a secondary crop, one that evolved first as a weed (in this case of wheat and barley) and only later was introduced as a crop. This is supported by its rather late appearance in the archaeological record (Helbaek 1971). The origins of cultivated rye probably lie in the weedy races of the *S. cereale* group found in Turkey, northern Iran, and adjacent Transcaucasia. These in turn probably evolved from the perennial complex referred to *S. montanum* Guss., the members of which are common in the high plateau of southwest Asia (for a review, *see* Zohary 1971).

Unlike wheat, barley, and oats, which are normally self-fertilized, both wild and cultivated rye are cross-pollinated.

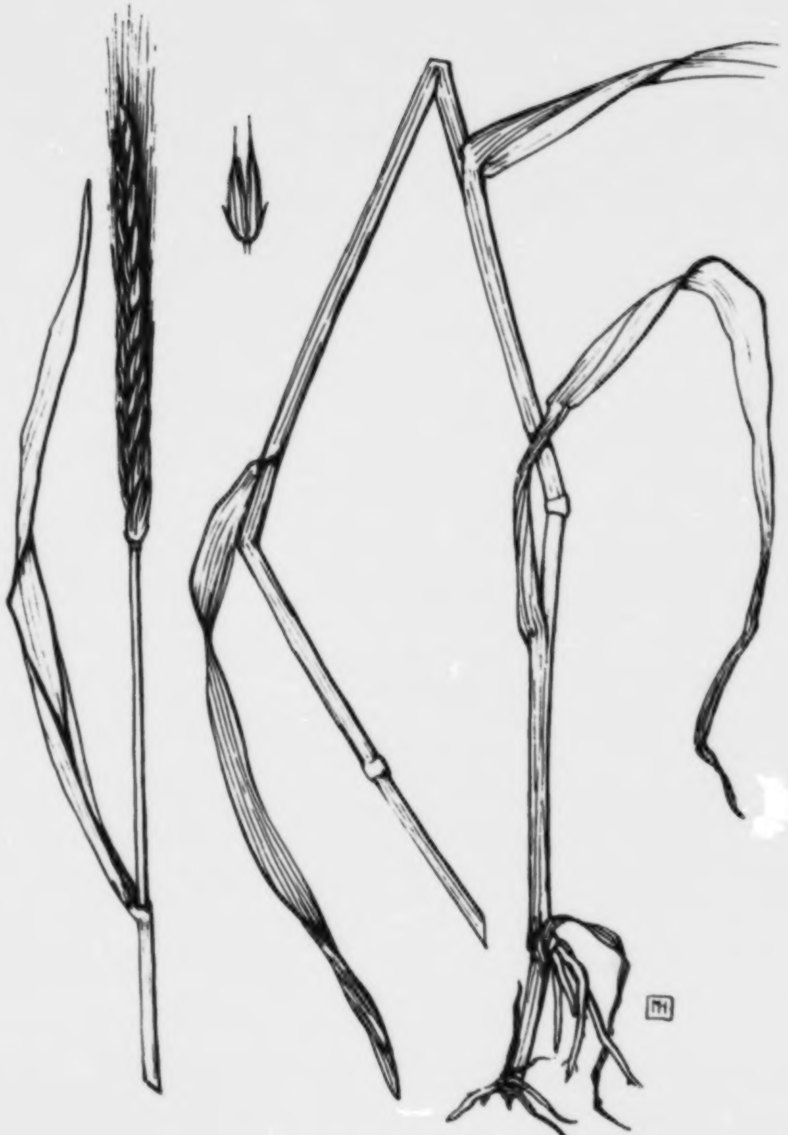


Fig. 10. *Secale cereale* L.

24. *Elymus* L. (incl. *Hystrix* Moench)

Coarse perennial native grasses. Leaf-sheaths sometimes with hook-like auricles; ligule short, membranous, and tough. Spikes erect or nodding. Spikelets in pairs at each node of the rachis, 2- to several-flowered. Glumes generally thick and hardened at base, turned slightly to the front of spikelet. Lemmas pointed or long-awned.

The delimitation of *Elymus*, *Agropyron*, and related genera and the significance of the additional synonyms of *Elymus* species are discussed after the generic description of *Agropyron* (p. 179).

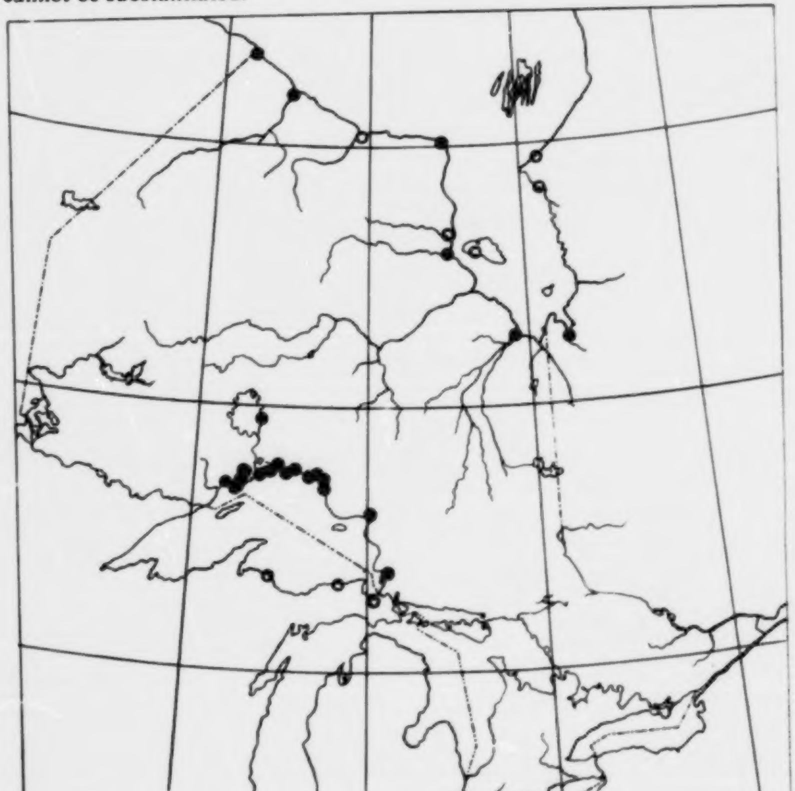
- A. Glumes 2–4 mm wide, lanceolate, not thickened or bowed out at base; rhizomes present .... 1. *E.* ***mollis***
- A. Glumes less than 2 mm wide, often subulate, occasionally one or both obsolete
  - B. Rhizomes present
    - C. Lemmas densely pubescent with awns 1–4 mm long .... 2. *E.* ***innovatus***
    - C. Lemmas hirsute or hirtellous with awns 5–10 mm long .... ×***Agroelymus hirtiflorus*** (p. 217)
  - B. Rhizomes absent; awns of lemmas usually more than 5 mm
    - D. Glumes unequal, or one or both absent; spikelets horizontally spreading .... 9. *E.* ***hystrix***
    - D. Glumes both present, ± equal; spikelets erect or ascending
      - E. Glumes less than 0.4(–0.5) mm wide, subulate, widest toward the base, nerveless or with 1–2 nerves; lemma awns straight; spikes erect .... 3. *E.* ***villosus***
      - E. Glumes (0.3–) 0.4–1.5 mm wide, widest toward the middle, distinctly 3- to 6-nerved
        - F. Awns curved when dry; spikes nodding
          - G. Leaf blades usually about 1 cm wide, firm, hairless .... 4. *E.* ***canadensis***
          - G. Leaf blades usually about 2 cm wide, soft, pilose above .... 5. *E.* ***wiegandii***
        - F. Awns straight when dry
          - H. Glumes about 1 mm wide at widest point, bases not bowed-out; spikes nodding; glumes persistent on rachis .... 6. *E.* ***riparius***
          - H. Glumes 1–2 mm wide at widest point; spikes erect
            - I. Glumes thin-margined, not bowed-out at base, persistent on rachis .... 7. *E.* ***glaucus***
            - I. Glumes thick, bowed-out at base, deciduous .... 8. *E.* ***virginicus***

1. *Elymus mollis* Trin. (*Leymus mollis* (Trin.) Pilger; *Elymus arenarius* var. *villosus* E. H. F. Meyer)

Plate 28, Map 95

American dune grass

A common species of the Atlantic coast and the Gulf of St. Lawrence, *Elymus mollis* is known in Ontario only on the sandy beaches of Lake Superior, Lake Nipigon, and of James and Hudson bays. These localities in the Great Lakes area and similar ones on Lake Michigan are the only inland occurrences of the species. A published record for Toronto (Scott 1913) cannot be substantiated.



Map 95. *Elymus mollis*. All known records from the area covered by the map are plotted.

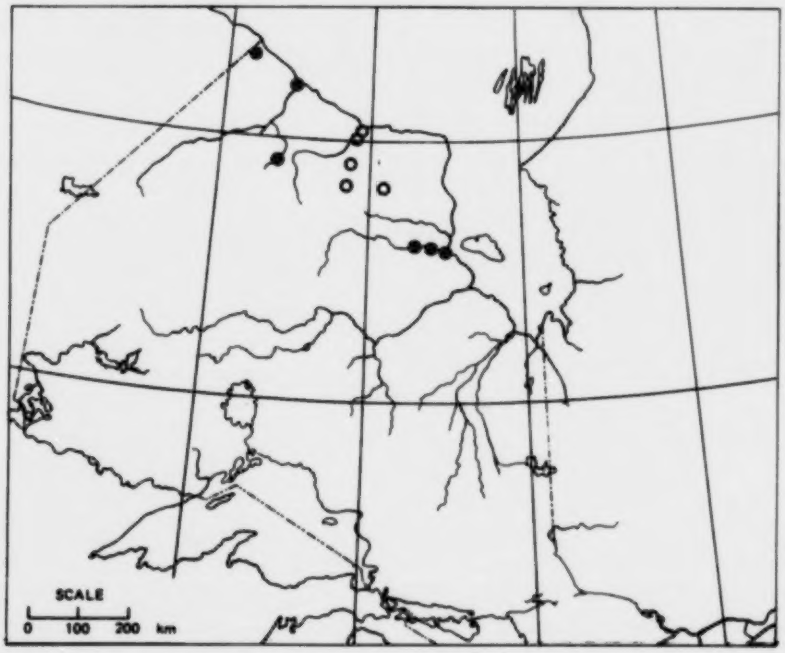
Within this widespread American and east Asiatic species, Bowden (1957) recognizes three subspecies, one with two varieties. The Ontario plants are all referable to subsp. *mollis* var. *mollis*.

Elymus arenarius **L. (*Leymus arenarius* (L.) Hochst.)**—This similar grass is native to Europe, and has been cultivated at the research stations at Ottawa and Harrow. Although it is sometimes planted to curb erosion, no such plantings are known in Ontario. It is distinguishable from *E. mollis* by its hairy upper culms and its more glaucous leaf blades.

2. *Elymus innovatus* Beal (*Leymus innovatus* (Beal) Pilger)

Plate 28, Map 96

Elymus innovatus, a species widespread in northwestern Canada, has densely pubescent spikelets, resembling those of *Agropyron dasystachyum*. In Ontario it is restricted to the lower reaches of the Attawapiskat River flowing into James Bay and of other rivers to the north and west entering Hudson Bay. It is not known in Quebec and would seem to have migrated eastward along the ancient beaches of Hudson Bay.



Map 96. *Elymus innovatus*. All known records from the area covered by the map are plotted.

3. *Elymus villosus* Muhl.

Plates 28 and 29, Map 97

A rare species of dry thickets and open woods, *Elymus villosus* is found in scattered localities across southern Ontario. Two variants are recognized, the widespread f. *villosus*, with villous spikelets and f. *arkansanus* (Scribner & C.R. Ball) Fernald with glabrous to scabrous glumes and lemmas.

Forma *villosus* has been collected in recent years at points near the shore of Lake Erie (Long Point, Delaware, Rondeau, and Point Pelee), at Dyer Bay in the Bruce Peninsula, and at Kagawong and Mindemoya on Manitoulin Island. It is also recorded in the Lake Erie area by Dodge (1914) and Core (1948). Earlier records exist from Niagara Falls (1879), London (1881), Galt (Cambridge) (1897), and Snelgrove, Peel County (1911), but at these places the species may now be extinct.

A single large patch was found in 1967 on the limestone at "The Scuttle Holes" on the Moira River near Latta, Hastings County. This locality and specimens from Summerstown, Glengarry County, and Ile Ste. Hélène in Montreal, Que., are three scattered occurrences, which are the most easterly in Canada. There is also a collection made by R. B. Whyte in 1891, labeled "Chat's Island." This may come from Chat Falls on the Ottawa River, near Fitzroy Harbour (Dore 1959).

Plants referable to f. *arkansanus* were collected for the first time in Canada at Kettle Point, Lake Huron shore, in 1948. The typical form was found later in the same area.

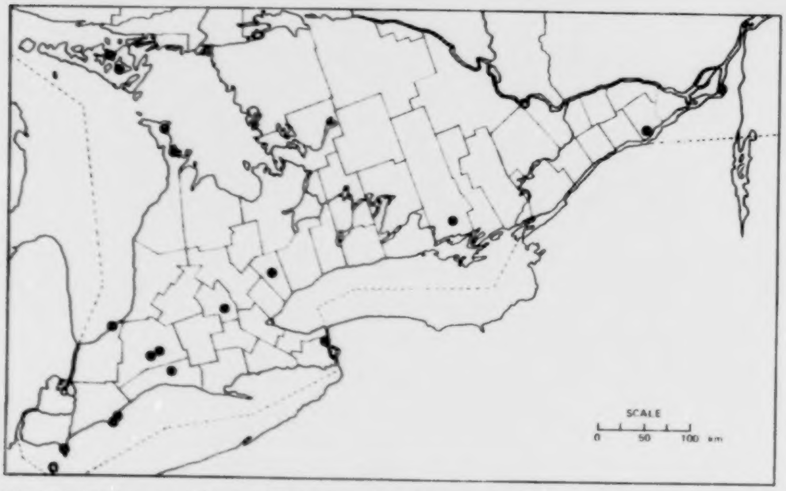
Early specimens are usually reported under the name of *E. striatus* Willd., which, as Fernald (1933) points out, is based on a small form of *E. virginicus*. Bowden (1964) reports a somatic chromosome number of $2n = 28$, for plants of f. *villosus* from Point Pelee.

4. *Elymus canadensis* L.

Plate 29, Map 98

Canada wild-rye

Elymus canadensis is a tall, coarse, native grass common along the dry sandy shores of the Great Lakes, from Sandbanks in Prince Edward County to Thunder Bay. It is also present along the Ottawa River above Ottawa, along the Trent River, at North Bay on Lake Nipissing, along the Rainy River west of Fort Francis in northwestern Ontario, and on some rivers draining into southern James Bay.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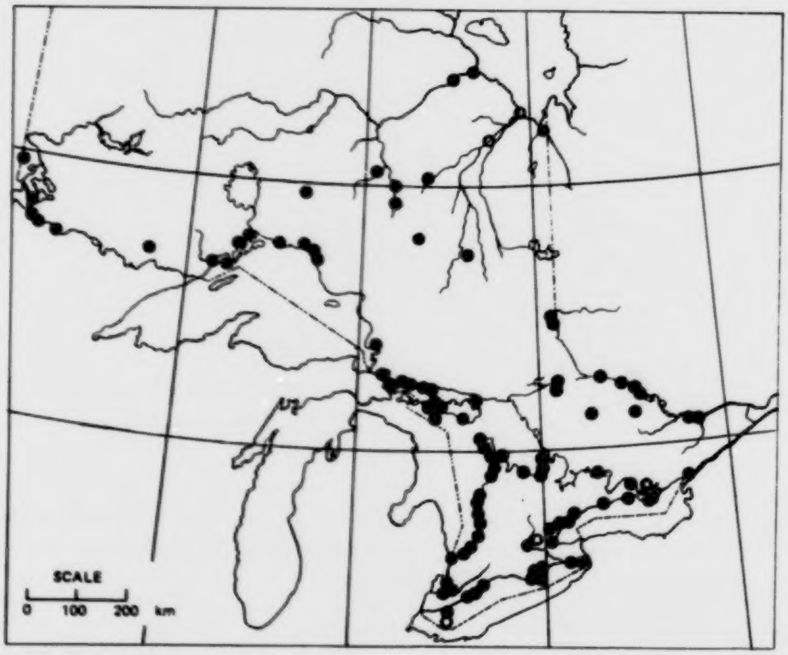
Map 97. *Elymus villosus*. All known Canadian records from the area covered by the map are plotted.



Map 98. *Elymus canadensis*.

It is perhaps surprising that so large and attractive a grass has not been collected at places such as Michipicoten, the islands in Lake Superior, Lake Nipigon, and the Nipigon River, French River, the eastern side of Georgian Bay, and the lower St. Lawrence River within Ontario. Most of the specimens from the north shore of Lake Superior seem to have been found on railroad ballast. Elsewhere the grass has been found in sandy areas at some distance from shoreline dunes, so it has probably spread with man-made disturbances. A specimen gathered in Algonquin Park in 1934 is known to have grown in a long-abandoned sandy clearing at a pioneer farmstead on Opeongo Lake; another specimen from Golden Lake, Renfrew County, may also have been carried in along settlement or logging roads. Some other old inland records can also be viewed as likely introductions.

This grass is able to withstand burial of its base by drifting sand and is sometimes referred to as a good sand-binding grass, but since it does not spread by rhizomes it is of limited value for this purpose.

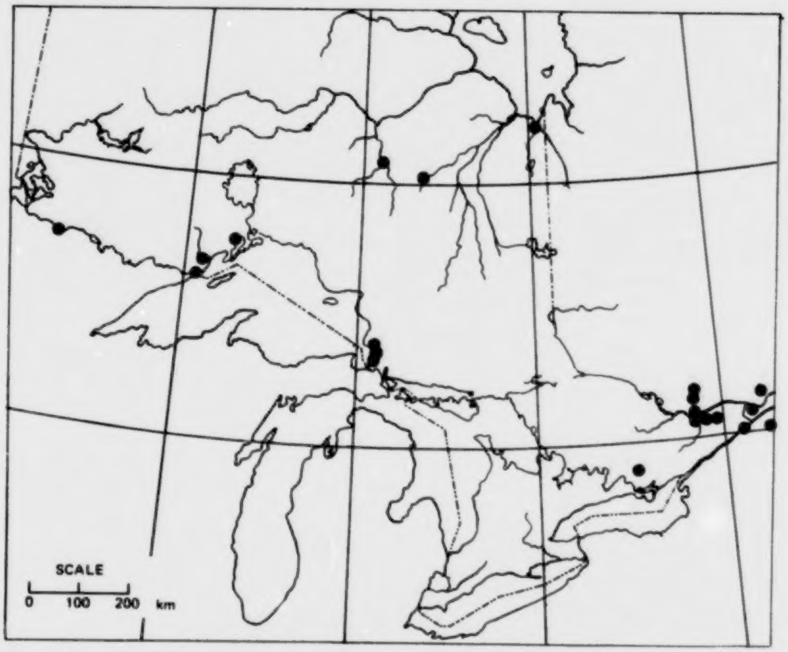
All the Ontario material is referable to var. *canadensis* in the broad sense adopted by Bowden (1964). However, considerable variation exists in the size and habit of the plant and in the size and attitude of its spike. Most of the specimens from the upper Ottawa Valley, Lake Nipissing, Rainy River District, and James Bay are more slender and have looser spikes, characteristic of the plants of the western provinces. Those from the Albany drainage have a hispid rachis and pubescent paleae and rachillae; they have been described by Lepage (1952) as var. *albanensis* Lepage. Plants with distinctly glaucous foliage (f. *glaucifolius* (Muhl.) Fernald) occupy similar habitats to green-leaved plants along the shores of the lower Great Lakes; elsewhere intermediates with slightly glaucous foliage are common.

5. *Elymus wiegandii* Fernald (*E. canadensis* var. *wiegandii* (Fernald) Bowden)

Plate 29, Map 99

Wiegand wild-rye

The taxonomic status of the distinctive *Elymus wiegandii*, impressive in its height, broad leaves, and drooping tassel-like spikes, is somewhat controversial. Although Fernald (1950) maintains it as a species, other manuals (Gleason and Cronquist 1963; Hitchcock and Chase 1951) have not distinguished it from *E. canadensis*, and Bowden (1964) treats it as a variety of that species because of the similarity in spikelet structure. It occupies a very different kind of habitat, however, from that of typical *E. canadensis*, and is found at the edges of thickets in moist bottomland meadows, where it is easily seen overtopping the other herbs. Under cultivation it maintains its majestic habit of growth.



Map 99. *Elymus wiegandii*. All known Canadian records from the area covered by the map are plotted.

Localities of *E. wiegandii* seem to cluster in the eastern counties adjacent to southwestern Quebec, around Batchawana Bay at the eastern end of Lake Superior, along some rivers that enter the western end of Lake Superior, and along others that drain into James Bay. Specimens from Fort Francis on Rainy River and from the Thunder Bay District, identified as *E. interruptus* Buckley, are now regarded as typical of *E. wiegandii*. *E. interruptus* does not range into Canada.

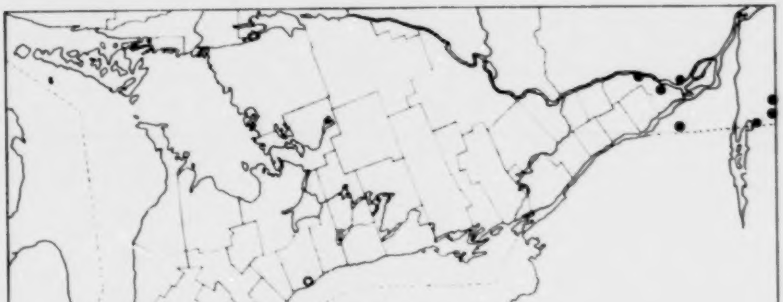
6. *Elymus riparius* Wieg.

Plate 30, Map 100

river bank wild-rye

A species common in central New York and Pennsylvania, *Elymus riparius* is rare in southern Ontario. Satisfactory specimens are now known from woods, usually along streams, at several sites between Hamilton and Sarnia, and at Trois Cedres Creek near Hawkesbury in eastern Ontario, which is near the western Quebec localities. Other specimens that may refer to this species have the spikelets shattered and determination is uncertain.

The somatic chromosome number of $2n = 28$ has been counted on a plant from Turkey Point, Regional Municipality of Haldimand-Norfolk (Bowden 1964).



Map 100. *Elymus riparius.* All known Canadian records from the area covered by the map are plotted.

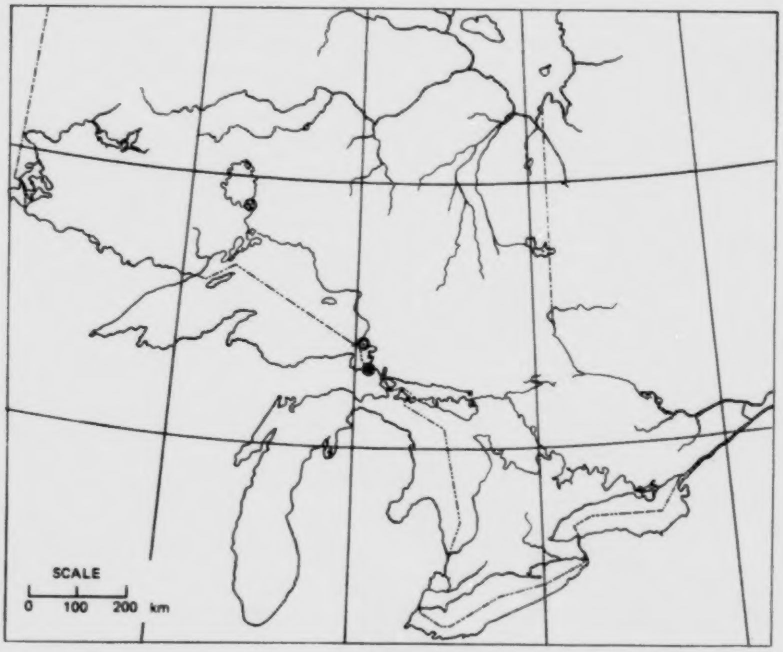
7. *Elymus glaucus* Buckley

Map 101

blue wild-rye

Macoun (1888) records *Elymus glaucus* for Ontario under the synonym *E. americanus* Vasey & Scribner. The localities he gives are "Mamainse, east coast of Lake Superior; Pine Portage, Nipigon River." The only Macoun specimen of *E. glaucus* seen was collected on July 27, 1869, on the "north shore of Lake Superior." Hitchcock and Chase (1951), in describing this abundant western species as occurring in Ontario, are apparently referring back to an 1884 Macoun specimen from the Nipigon River.

The occurrence of this rare species in Ontario was confirmed in 1949 by a collection by C. Frankton and H. A. Senn at Gros Cap at the east end of Lake Superior, about 25 km above Sault Ste. Marie. The species has the general appearance of *Agropyron trachycaulum* and could easily be overlooked.



Map 101. *Elymus glaucus.*

Viable seedlings from the Gros Cap collection were found to have a somatic chromosome number of $2n = 28$ (Bowden 1964).

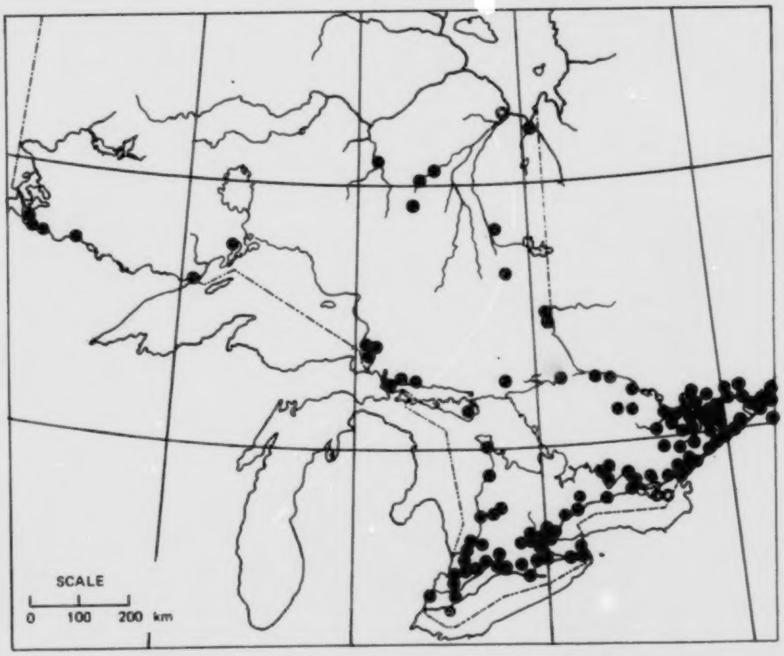
8. *Elymus virginicus* L.

Fig. 11, Plate 30, Map 102

Virginia wild-rye

Elymus virginicus is common along streambanks and ditches in parts of southern Ontario but is rare elsewhere. It is a species of wet open woods and swamps and is not found on sandy shores like *E. canadensis*. Its apparent absence in the Lake Nipigon and Lake Superior north shore areas and from Georgian Bay to Algonquin Park is notable.

The species complex in Ontario shows considerable variability and several infraspecific taxa have been recognized, including the following:



Map 102. *Elymus virginicus* (all varieties). All known Canadian records from the area covered by the map are plotted.

- A. Glumes and lemmas long-awned, those of the lemmas (4–)6–12 mm long .... a. var. ***virginicus***
- A. Glumes and lemmas mucronate to short-awned, those of the lemmas 0.3–2(–4) mm long
  - B. Glumes and lemmas glabrous to scabrous or scabrous-ciliate .... b. var. ***submuticus***
  - B. Glumes and lemmas hirsute .... c. var. ***jenkinsii***

8a. var. *virginicus*

Var. *virginicus* has inflated upper sheaths and partially included or barely exserted spikes. It is common across the southern counties from the lower Ottawa Valley to the Bruce Peninsula. It is also present around Batchawana Bay and the western end of Lake Huron in the Algoma District, at Lake Temiscaming, and scattered points northward to James Bay where it has been collected at the mouth of the Kesagami River. It has also been reported at Moosonee, although it appears to be absent in northern Quebec.

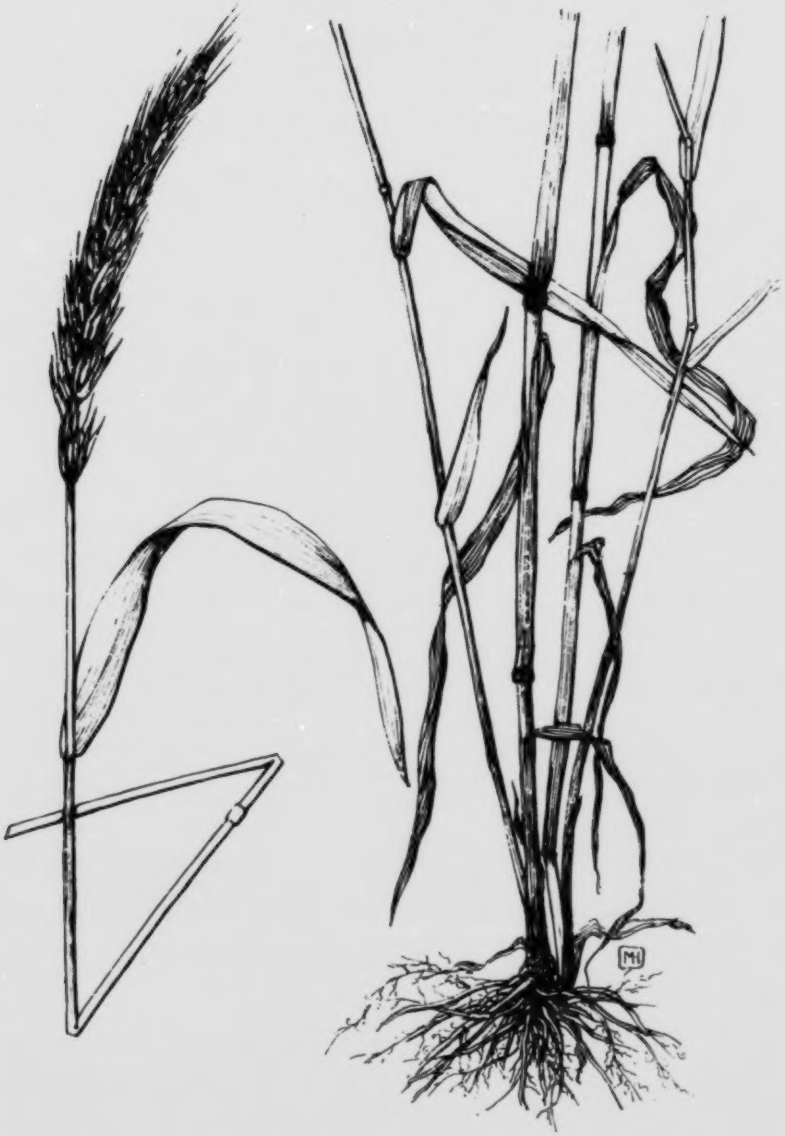


Fig. 11. *Elymus virginicus* L. var. *virginicus*.

Plants with pilose-hispid glumes and lemmas have been termed f. *hirsutiglumis* (Scribner) Fernald. These are distributed widely across the province although they are much less common than those of f. *virginicus* (13 records against 138). Plants of var. *virginicus* generally have hairless, smooth leaves, but in the Ottawa Valley there are many with scabrous and hirsute leaf sheaths. The extreme of this tendency is seen in a collection from near Lake Nipissing with distinctly pilose sheaths and blades. Other variants encountered in Ontario include plants with strongly reddened culms and spikes.

8b. var. *submuticus* Hooker

This variety is common in the Prairie Provinces and is represented in Ontario by specimens from the Rainy River and Thunder Bay areas. It is also known at Port Hope, Northumberland County, where it may have been introduced from the west.

8c. var. *jenkinsii* Bowden

Var. *jenkinsii*, like var. *submuticus*, has awns reduced to mere points but differs from that variety in its hirsute spikelets and its local distribution in western Quebec and adjacent Ontario. The only known Ontario occurrence is at L'Orignal, Prescott County.

Hybrids between *E. virginicus* and *E. canadensis* or *E. wiegandii* have been found at Ottawa and Fort Francis, both places where one of the parents is rare. These plants have been named *Elymus* ×*maltei* Bowden (*see* Bowden 1964). The hybrids are distinctive in that the spike is neither erect nor drooping, but simply arching, and this feature shows up strikingly when plants are grown side by side.

9. *Elymus hystrix* L. (*Hystrix patula* Moench)

Fig. 12, Plate 30, Map 103

bottlebrush grass

Elymus hystrix occurs in woods on rocky land where it grows vigorously following clearing. It is frequent throughout much of the southern part of the province from the Ottawa-Carleton Regional Municipality to Huron County with scattered occurrences in the Bruce Peninsula, on Manitoulin Island, near Sault Ste. Marie, and west of Thunder Bay. This pattern might suggest restriction to the Palaeozoic sediments, but the plant grows also on the adjoining igneous rock, e.g., in the Rideau Lakes, at Dorset (Muskoka), and at Sault Ste. Marie.

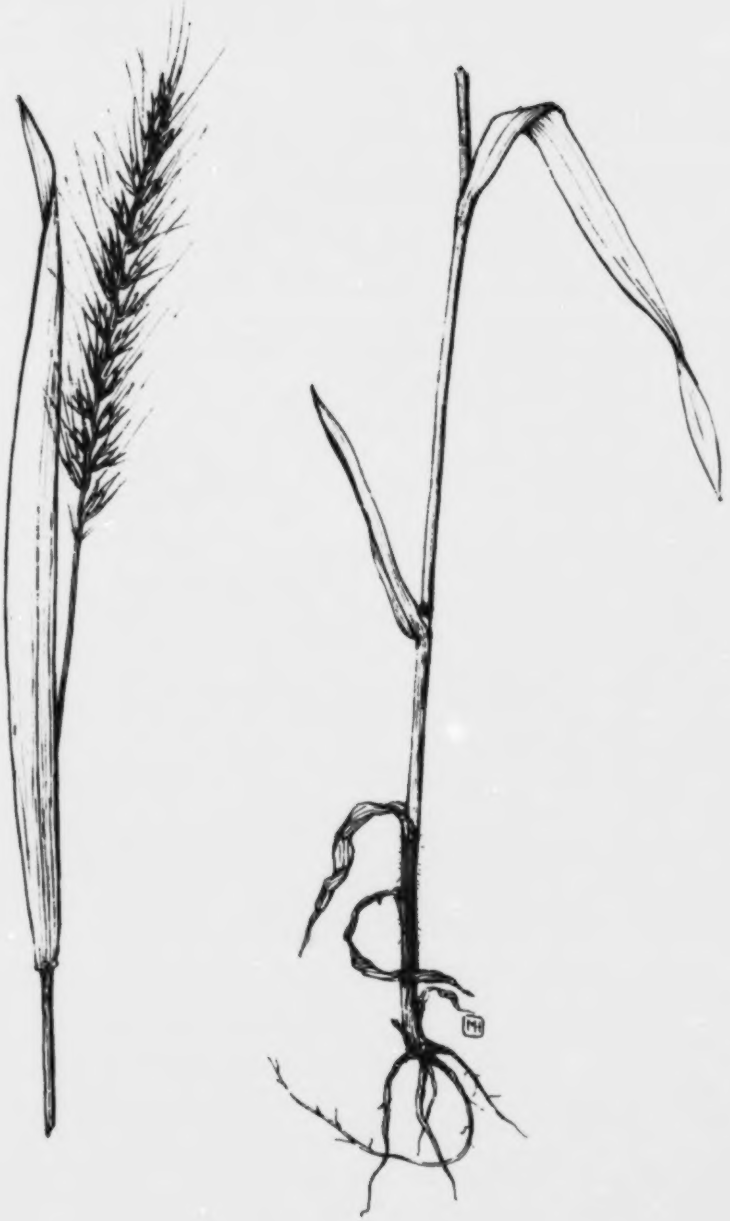
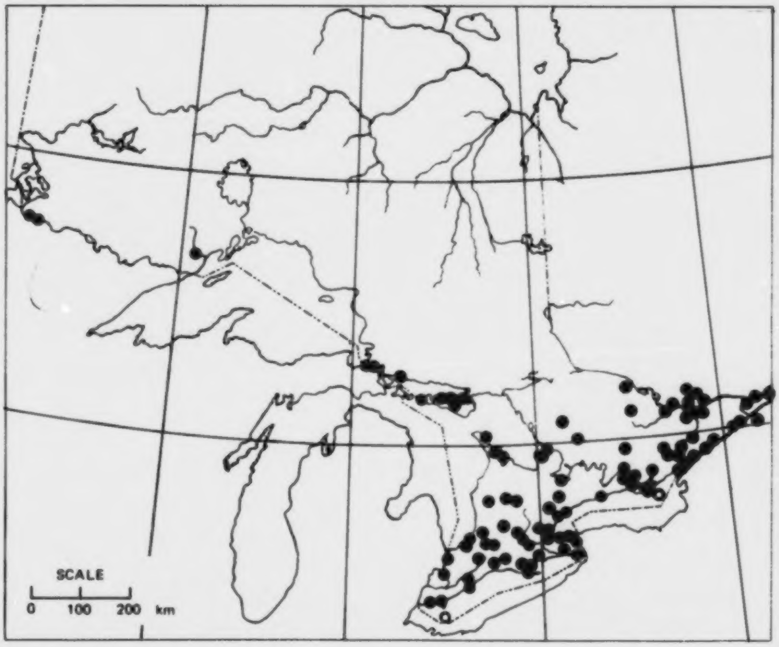


Fig. 12. *Elymus hystrix* L.



Map 103. *Elymus hystrix*. All known Canadian records from the area covered by the map are plotted.

Bottlebrush grass, with its open spikes of striking and rather attractive appearance, can be used in gardens for its ornamental value. For dry bouquets it should be picked no later than flowering time to prevent shattering.

The typical form (f. *hystrix*) has smooth lemmas but in f. *bigelovianus* (Fernald) Dore, the lemmas are pubescent. These pubescent plants can be picked out rather easily when back-illuminated in bright sunlight. Both forms appear to have the same range in Ontario and are often present in the same vicinity but seldom intermixed. An intermediate condition of scabrous lemmas is shown in a specimen from Wales, Stormont County. Fernald (1950) claims that f. *bigelovianus* is "more frequent northward." Random collections from Ontario show 75 specimens of f. *hystrix* to 79 of f. *bigelovianus* with 4 specimens intermediate. Seven out of eight specimens from the Bruce Peninsula and Manitoulin Island are, however, f. *hystrix*. The species also exhibits other variable features such as pubescent vs. hairless leaf sheaths and blades; green vs. glaucous foliage; and short (3 cm) vs. long (6 cm) awns. These variations show no correlation with one another or with the lemma character, and no apparent geographic segregation.

This species is included in the genus *Hystrix* in Hitchcock and Chase (1951) and other manuals. Bowden (1964) gives the reasons for returning it to the genus *Elymus*, a treatment that has been followed by Mohlenbrock (1972).

A sterile plant collected along with a stem of *Elymus hystrix* near Stanley, Thunder Bay District, is considered to be a hybrid with *Agropyron trachycaulum*, because it combines the characters of these two species. Plants that appear to be the product of hybridization between *E. hystrix* and *E. virginicus* have been discovered at Champlain Provincial Park, near Mattawa.

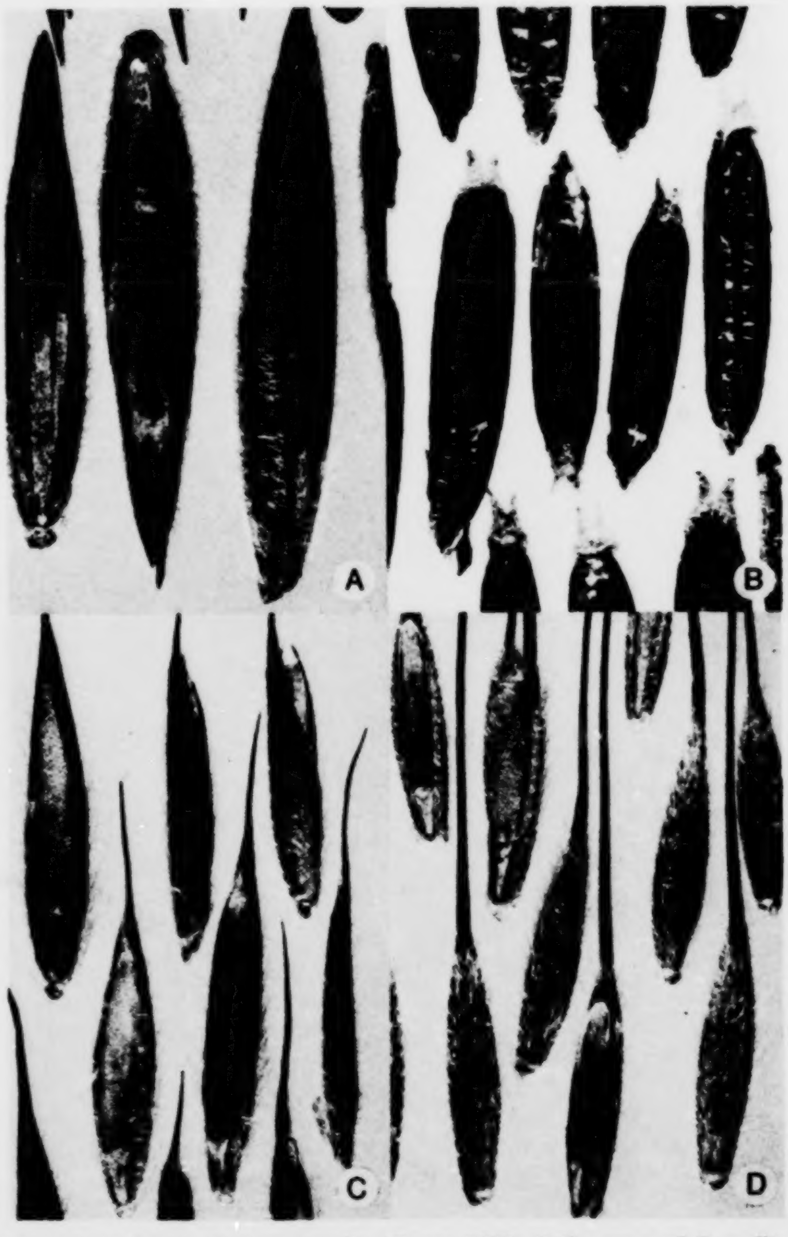


Plate 28. *A*, Florets of *Elymus mollis* (Garton 6678); *B*, Caryopses of *E. mollis* (Garton 6678); *C*, Florets of *E. innovatus* (Moir 906); *D*, Florets of *E. villosus* f. *villosus* (Frith 52).

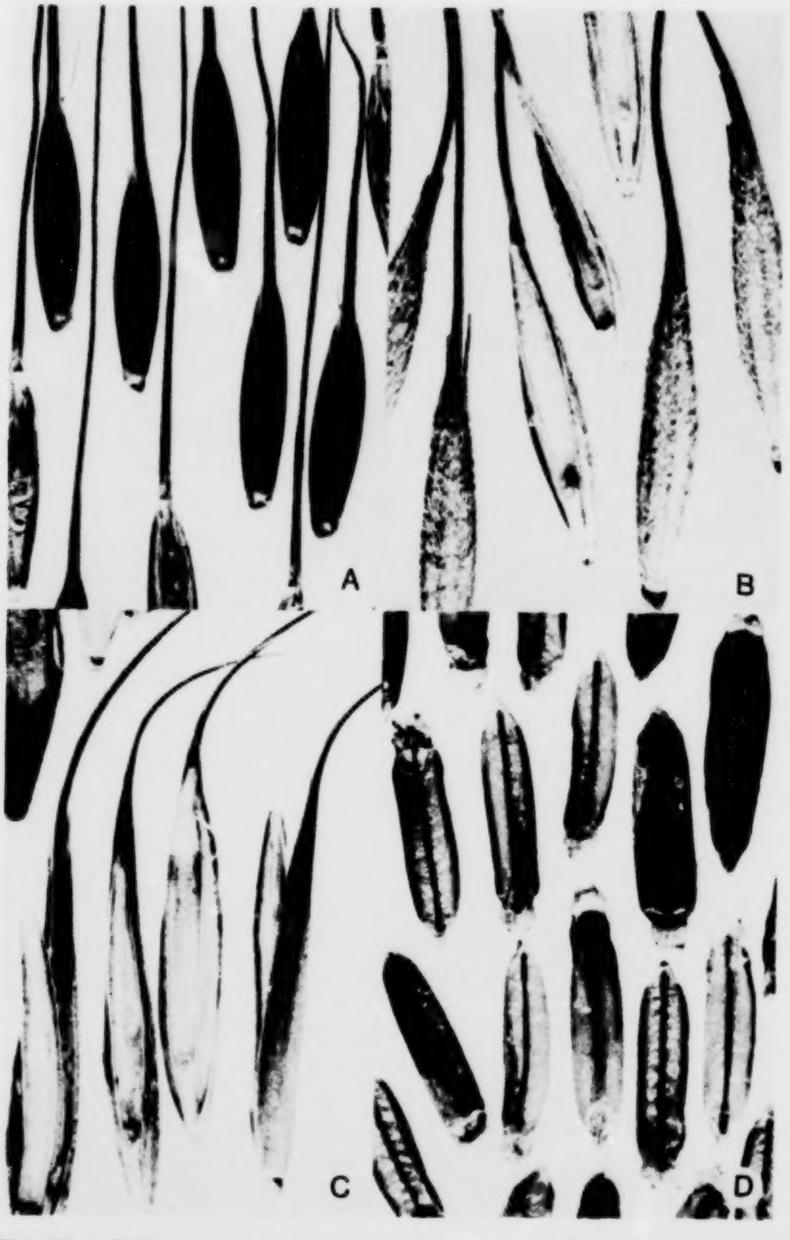


Plate 29. *A*, Florets of *Elymus villosus* f. *arkansanus* (Dore 8847); *B*, Florets of *E. canadensis* (Dore 21236); *C*, Florets of *E. wiegandii* (cultivated from Dore 17442); *D*, Caryopses of *E. wiegandii* (cultivated from Dore 17442).

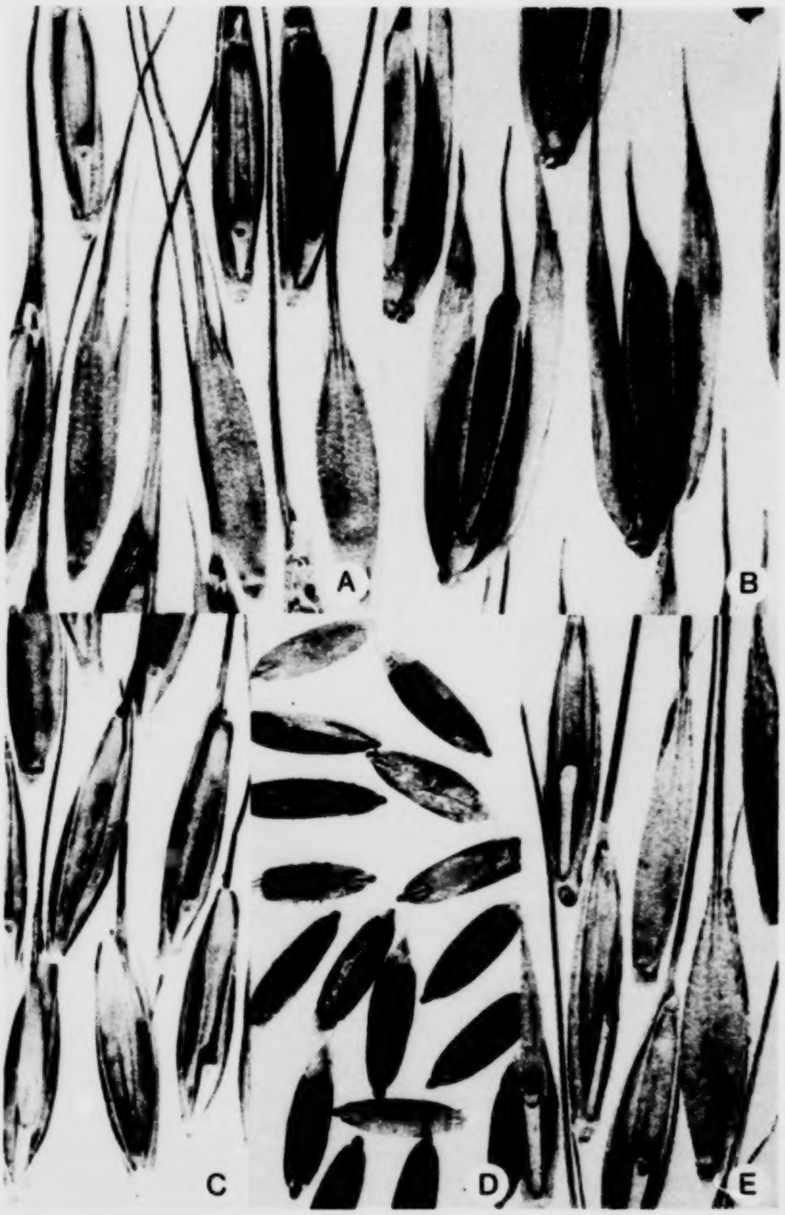


Plate 30. *A*, Florets of *Elymus riparius* (Dore 10339); *B*, Spikelets of *E. virginicus* var. *virginicus* (Dore 17339); *C*, Florets of *E. virginicus* var. *virginicus* (Dore 21237); *D*, Caryopses of *E. virginicus* var. *virginicus* (Dore 17339); *E*, Florets of *E. hystrix* f. *bigeloviana* (Dore 21133).

25. ×Agrohordeum Camus ex A. Camus

×*Agrohordeum* is the "generic name" for hybrids between species of *Agropyron* and *Hordeum*. Two such intergeneric hybrid combinations are known in North America (Bowden 1967). These generally combine the characters of the two genera, and the tendency to produce paired spikelets (intermediate between the solitary spikelets of *Agropyron* and the usual arrangement in threes in *Hordeum*) has sometimes led to their inclusion in the genus *Elymus*.

Hybrids between species of several other genera of the Triticeae occur (Bowden 1967). Of these, ×*Agroelymus* Camus ex A. Camus is also known from Ontario.

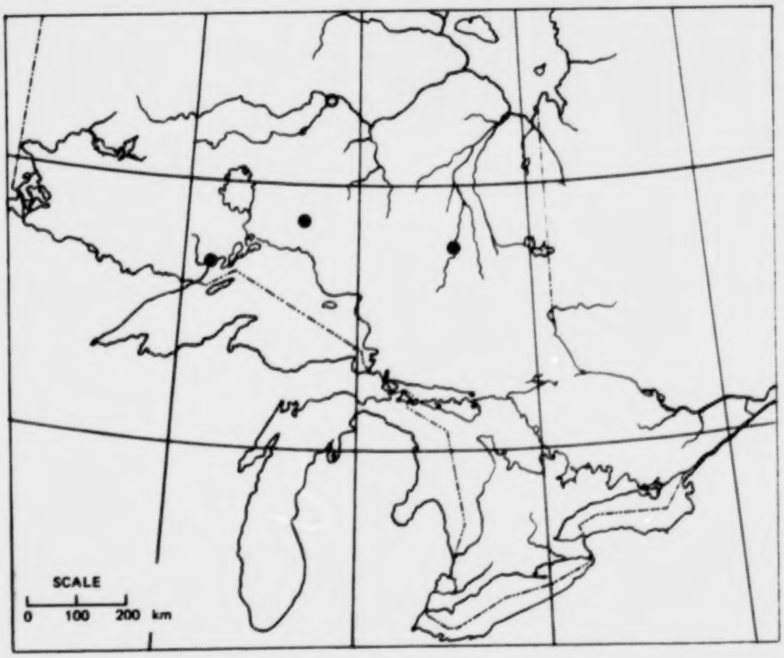
1. ×*Agrohordeum macounii* (Vasey) Lepage (*Elymus macounii* Vasey)

Map 104

Macoun wild-rye

×*Agrohordeum macounii*, a hybrid, has the paired spikelets of an *Elymus* but the general appearance of a tufted *Agropyron*. The facts of its genetic origin as a hybrid between *Hordeum jubatum* and *Agropyron trachycaulum* are now well established (Boyle and Holmgren 1955, Gross 1960). The plants are sterile and therefore cannot spread by seed, but appear to arise at sites where the two parents are present. Their variation reflects that of their parents.

Three locations for this hybrid are known with certainty in Ontario: Thunder Bay, Longlac (Thunder Bay District), and Kapuskasing. The last two are on railway embankments and at Longlac two collections are known, one in 1952 and the second 10 years later. It is likely that such plants, isolated along the transcontinental railway, result from F_1 seed that is formed in the Prairie Provinces, where both parents are prevalent and hybridization is frequent, and then is carried eastward. Local hybridization is also possible after the invasion by *Hordeum jubatum*. The plant collected at Thunder Bay may be a local hybrid, because both parents are known to be present at the same site.



Map 104. ×*Agrohordeum macounii.*

×*Agroelymus hirtiflorus* (A.S. Hitchc.) Bowden (×*A. ontariensis* Lepage, *Elymus hirtiflorus* A.S. Hitchc.)—This hybrid between *Agropyron trachycaulum* and *Elymus innovatus* is also known from three places in Ontario, all in the James Bay area. These are mapped by Lepage (1966).

26. Hordeum L.

Annual or perennial tufted grasses. Ligule short, membranous. Spikes with 3 spikelets at a node, sometimes only the central one developed and the lateral ones then abortive and stalked. Spikelets 1-flowered. Glumes and lemmas long-awned, except in some cultivars. Rachis, except in the cultivated species, breaking up readily at maturity. Grain adherent to lemma and palea at maturity.

A. Leaves with conspicuous auricles; rachis not breaking up readily at maturity; body of lemma about 10 mm long; annual; cultivated cereal .... 1. ***H. vulgare***
A. Leaves without auricles; rachis breaking up at maturity; body of lemma less than 8 mm long; perennial or annual weeds
  B. Perennial; glumes subulate, tapering from the base; lemma awns 25–60 mm, slender; spike tassel-like; common .... 2. ***H. jubatum***
  B. Annual; glumes widest above the base; awns less than 15 mm long, coarse; spike not tassel-like; rare .... 3. ***H. pusillum***

1. *Hordeum vulgare* L.

Plate 31

barley

Hordeum vulgare is commonly grown as a feed grain, for malting, for food, and sometimes for forage. Stray plants may spring up in fields and around barnyards and granaries, but do not persist from year to year.

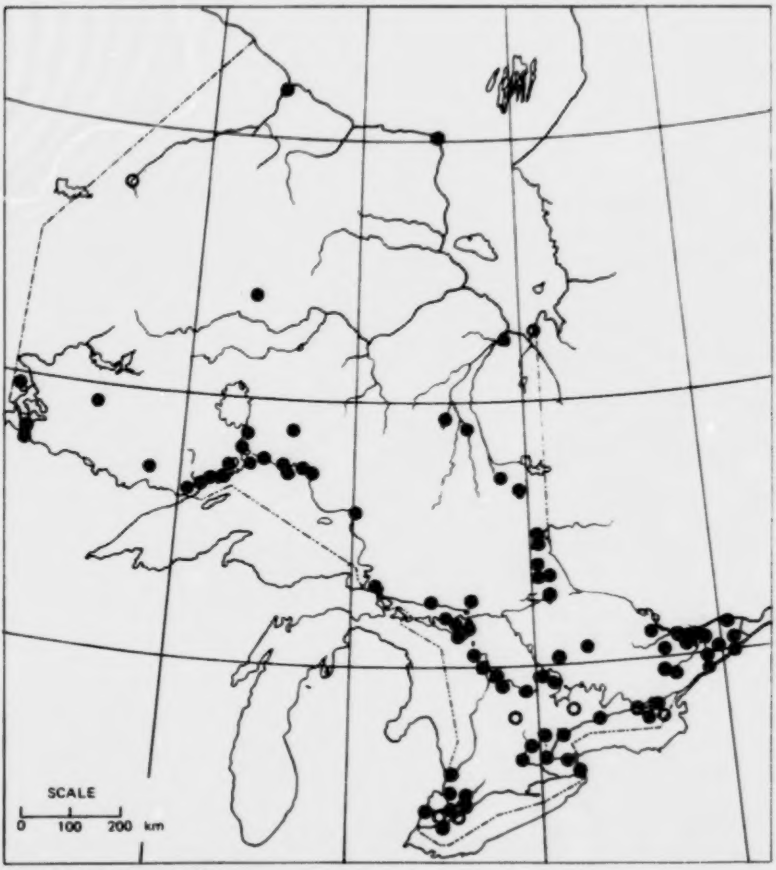
The numerous cultivars grown in Ontario fall into two main groups: six-rowed barley (Vulgare group) and two-rowed barley (Distichon group). These are distinguished by whether or not the lateral florets develop. A curious form of six-rowed barley with a short 3-lobed awn, known as hooded barley (Trifurcatum subgroup) (Bowden 1959), is sometimes encountered. Descriptions of barley cultivars appear in agronomic publications such as Wiebe and Reid (1961).

2. *Hordeum jubatum* L. (*Critesion jubatum* (L.) Nevski)

Plate 31, Map 105

foxtail barley, squirrel-tail grass

Originally *Hordeum jubatum* appears to have been native only in the northern portions of Ontario, along the shores of the upper Great Lakes, and Hudson and James bays. It is, however, now widespread. In his *Catalogue*, Macoun (1888) listed the species from "Ottawa, Sault Ste. Marie, North Shore of Lake Superior, Current River, Pic River, Ft. William, Nipigon House, Port Arthur, Moose Factory, and Severn River," all localities outside southern Ontario except Ottawa. The Ottawa record refers to a



Map 105. *Hordeum jubatum*.

collection in 1879 from "O'Connor Street," probably a stray weed and an introduction even at that early date. The only other collections in southern Ontario before 1900 were at Broadview in Toronto in 1893 and at Fort Erie, Niagara, in 1899.

During the first decade of the present century, the weed turned up at Hespeler, Waterloo Region; Guelph; Snelgrove, Peel Region; and Plevna, Frontenac County. By 1915, Dodge reported that in Lambton County it was "becoming frequent in towns, villages, on roadsides ... liable to become a vicious weed." This prediction was soon to become true, for in the three southwestern counties, as in some other portions of the province, it is now abundant, drifting along on its long-awned spikelets to sites wherever the soil is open for easy establishment. Its apparent tolerance of saline soil allows it to spread along winter-salted highways. Barnyards trampled by cattle, particularly if the soil is heavy and moist, are also characteristic sites for dense establishment.

Despite its spread, there are still large portions of the central and eastern counties where the plant appears to be absent or where incipient infestations are widely separated.

Variation in color of the awns, from pale green to purple, is particularly noticeable when the heads are immature. This does not seem to be correlated with ecology or weediness and is of no taxonomic significance. Many writers who stress the harmful nature of this grass report that the rough slender awns cause severe irritation to the eyes and nostrils of livestock. With man it is the sharp-pointed base of the spikelet clusters that causes annoyance because the clusters work their way into clothing after the slender awns have broken off.

Hybrids between *H. jubatum* and the western *H. brachyantherum* Nevski (*H. jubatum* subsp. *breviaristatum* Bowden) are abundant in the western provinces. These plants are distinguished from *H. jubatum* (*sensu stricto*) by their shorter lemma awns and glumes (both usually less than 30 mm). One specimen of such a plant is known from an Ontario collection made in 1872 near Lake Superior by J. M. Macoun. These hybrids have been known as *H. jubatum* var. *caespitosum* (Scribner) A.S. Hitchc. and are referred by Bowden (1962) to *H. jubatum* subsp. ×*intermedium* Bowden.

3. *Hordeum pusillum* Nutt. (*Critesion pusillum* (Nutt.) A. Löve)

little barley

Hordeum pusillum, a species native to and common in the United States, was reported by Macoun (1888) as having been introduced along the railway at Amherstburg in 1882. It has not been encountered subsequently and apparently has not persisted in Ontario.

Hordeum geniculatum All. (H. hystrix Roth)—A specimen labeled "*H. pusillum*, Ball Grounds, Toronto," collected by W. Scott in 1904, belongs to this species of Mediterranean origin. The species is similar to *H. pusillum* but differs in that the glumes of the fertile spikelets are not dilated above the base. It is widely naturalized in western North America but has never been found again in Ontario.

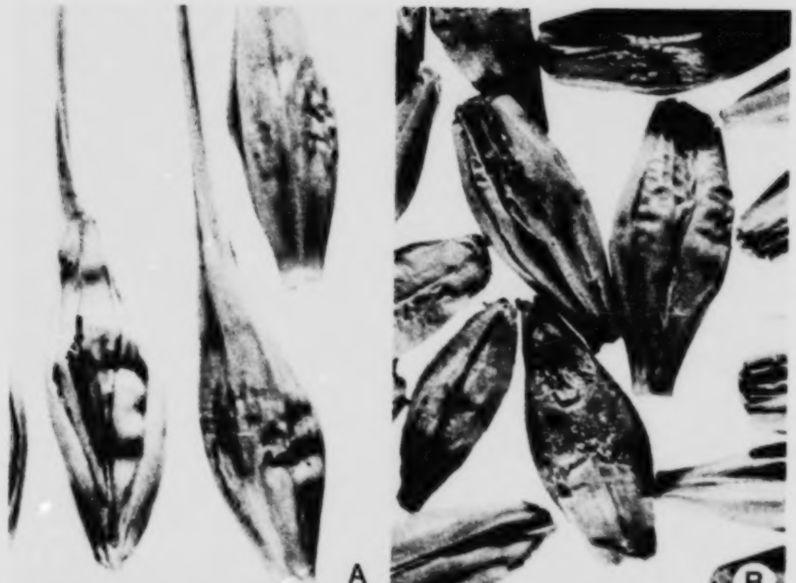


Plate 31. *A*, Florets of ***Hordeum vulgare*** (Rhodes 10034); *B*, Threshed florets of *H. vulgare* cv. Brant (cultivated at Ottawa); *C*, Caryopses of *H. vulgare* (Rhodes 10034); *D*, Spikelets of *H. jubatum* (Watson 4107).

27. Lolium L.

Annual or perennial nonrhizomatous grasses. Foliage hairless; ligule membranous, short. Spikelets sessile in a simple spike, borne singly at the nodes on alternate sides of the rachis, the back of one rank of lemmas against the rachis. Lower (inner) glume lacking, except in the terminal spikelet; upper glume present in all spikelets, firm in texture, usually longer than the adjacent lemma, but often shorter than the spikelet, not awned. Lemmas awned or awnless. Ripe grain adherent to lemma and palea.

Because of its superficial similarity to *Agropyron* in its sessile spikelets, *Lolium* was originally placed in the tribe Triticeae. Its close relationship to *Festuca* (tribe Poeae), with which it forms intergeneric hybrids (Terrell 1966; Jauhar 1975) has long been recognized (Hubbard 1948), and it is placed here only to follow the sequence of genera used by Hitchcock and Chase (1951).

A. Glume longer than the spikelet (excluding awns); mature lemmas firm in texture, ovate-elliptical, up to 3 times as long as wide; annual, lacking vegetative shoots .... 1. *L.* ***temulentum***
A. Glume shorter than or equal to the spikelet; mature lemmas herbaceous in texture, lanceolate or elliptical-lanceolate, more than 3 times longer than wide
  B. Glume up to about half the length of the spikelet (excluding awns); lemmas 5–8 mm long, awnless to long-awned; biennial to perennial, occasionally annual, usually with some vegetative shoots .... 2. *L.* ***perenne***
  B. Glume over half the length of the spikelet (excluding awns); lemmas 8–11 mm long, long-awned; annual, lacking vegetative shoots .... 3. *L.* ***persicum***

1. *Lolium temulentum* L.

Plate 32, Map 106

darnel

Lolium temulentum is a coarse annual grass occurring rarely and sporadically and not persisting from year to year. Its grain is large and known to be poisonous because of a fungal infection. The species is common as a weed in grainfields in Europe where several variants have been described, two of which are represented in Ontario.

Lemma with long awns, about equaling the body of the lemma ....a. var. ***temulentum***
Lemma awnless or with a rudimentary awn ....b. var. ***arvense***

1a. var. *temulentum*

The long-awned var. *temulentum* is known from three collections in Ontario; an early (1892) cultivation of the plant at the Experimental Farm, Ottawa, and spontaneous occurrences at Snelgrove (Peel Region) in 1913 and at Sarnia in 1952. The last of these was introduced with oats imported from Kentucky.

1b. var. *arvense* Liljeblad (var. *leptochaeton* A. Braun)

Var. *arvense*, an awnless variety, was found on a dump at Guelph in 1928, at the harbor front at Kingston in 1932, and has also been cultivated experimentally at Guelph and Ottawa.

2. *Lolium perenne* L. (incl. *L. multiflorum* Lam.)

Figs. 13 and 14, Maps 107 and 108

rye grass

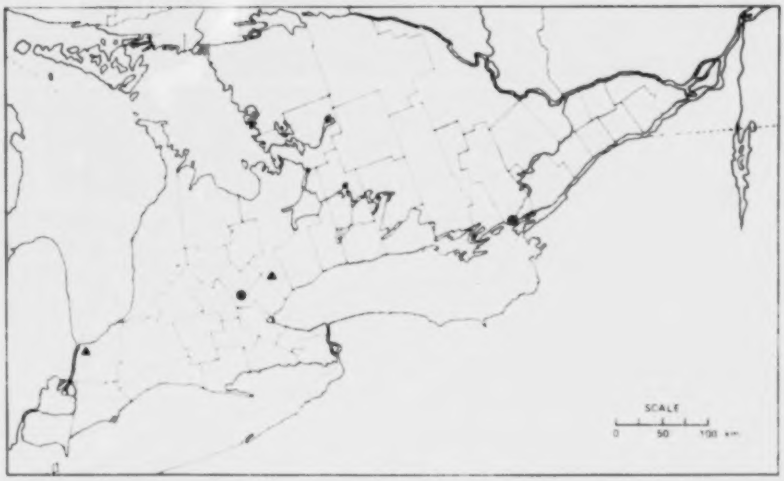
A forage rye grass introduced from Europe, *Lolium perenne* is generally considered to comprise two species. However, extensive hybridization between them has made their separate recognition difficult, at least in North America (cf. Vasek and Ferguson 1963), and they are treated here as varieties of the one species.

Lemmas awnless or with an awn less than 1 mm long; vegetative leaf blades
  conduplicate; perennial...a. var. ***perenne***
At least some lemmas with an awn more than 1 mm long; vegetative leaf blades
  convolute; annual, biennial, or short-lived perennial..................b. var. ***aristatum***

2a. var. *perenne*

perennial rye grass, English rye grass

Var. *perenne* is a valuable turf and forage grass in Europe. It has been continually introduced into North America in lawn and pasture mixtures, but in Ontario it has not usually persisted for more than a year or two. It makes rapid growth within a few weeks of seeding and because of this, it has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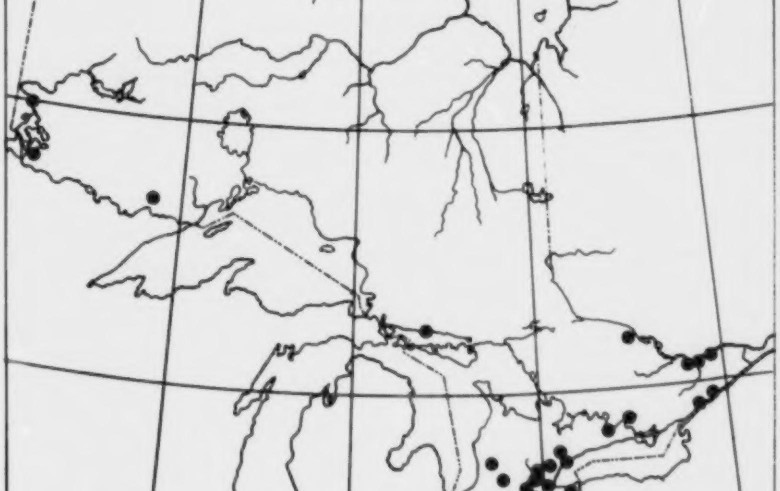
Map 106. *Lolium temulentum* var. *temulentum* (▲) and var. *arvense* (●).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Map 107. *Lolium perenne* var. *perenne*.

been widely used as a companion crop, to give a quick leafy sward while waiting for the slower-growing but more permanent grasses in the mixture to get established.

Although a perennial, it is rather short-lived. It may bloom in the first year if seeded early, or early in the next season if seeded late. Generally it is rather susceptible to winter killing and does not survive most winters. Since 1958 a selection, Norlea rye grass, developed in Ottawa from a composite population of hardy types, has proved useful for its persistence and rapid, uniform growth (MacVicar 1958). Other cultivars in use in North America are described in Hanson (1972).

2b. var. *aristatum* Willd. (*L. multiflorum* Lam.)

Italian rye grass

Var. *aristatum* is a stouter plant than perennial rye grass, often with broader leaf blades that are rolled-in, rather than folded, in the vegetative shoots. In its habit of growth it is also somewhat different, generally behaving as a biennial, flowering profusely in the second year and then dying. Var. *aristatum* and intermediates with var. *perenne* are probably present in much of the rye grass seed imported for lawn mixtures, but because they do not persist as long as var. *perenne*, they are not found as often in Ontario.

Voss (1972*a*) has shown that when treated as a variety of *L. perenne*, Italian rye grass should be called var. *aristatum* and not var. *italicum* or var. *multiflorum*.

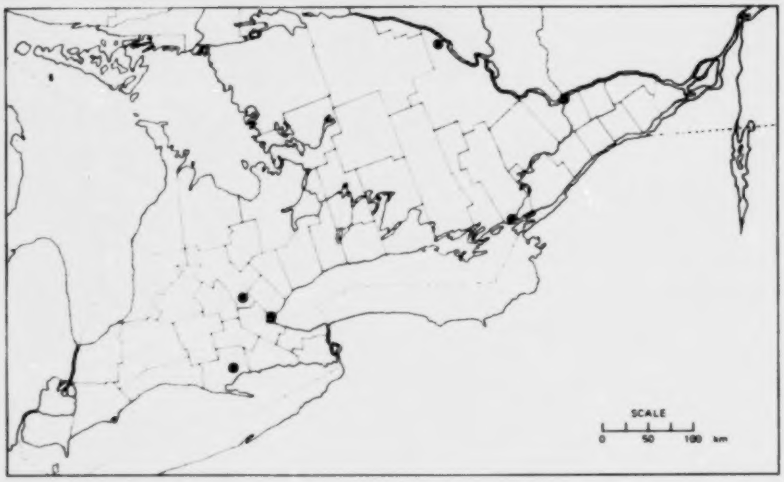
3. *Lolium persicum* Boiss. & Hohen. ex Boiss.

Map 109

Persian darnel

Detected first in North Dakota about 1910, *Lolium persicum* now infests large areas in the wheat-growing region of the Prairie Provinces. Brought eastward, probably in grain or seed cleanings to be used for feed, Persian darnel has appeared in Ontario as follows: at an old camp clearing on Mortimer Island in Lake Superior opposite Schreiber in 1937; in railroad gravel at Nipigon in 1939; and in the yard of the Veterinary College, Guelph, in 1946.

For a long time the weed in North America was confused with other *Lolium* species (*see* Dore 1950).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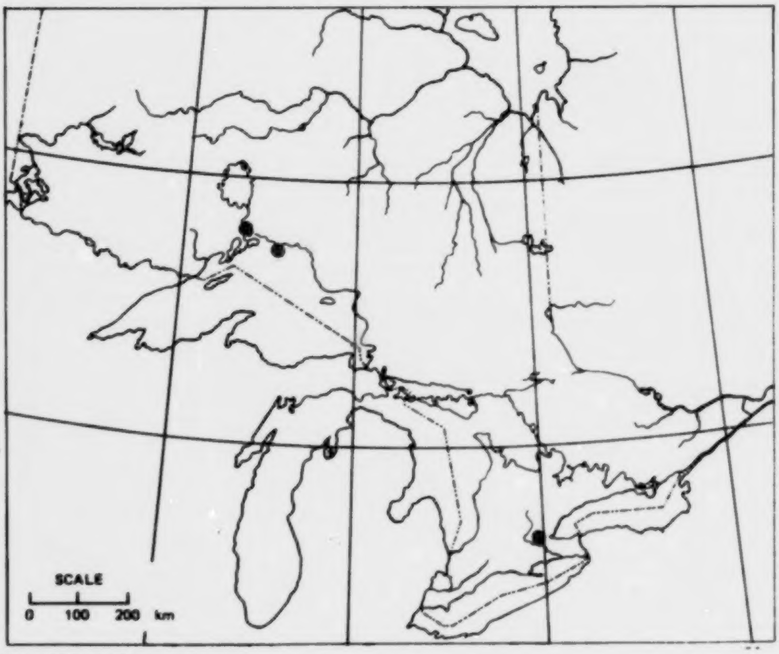
Map 108. *Lolium perenne* var. *aristatum*.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Map 109. *Lolium persicum*.

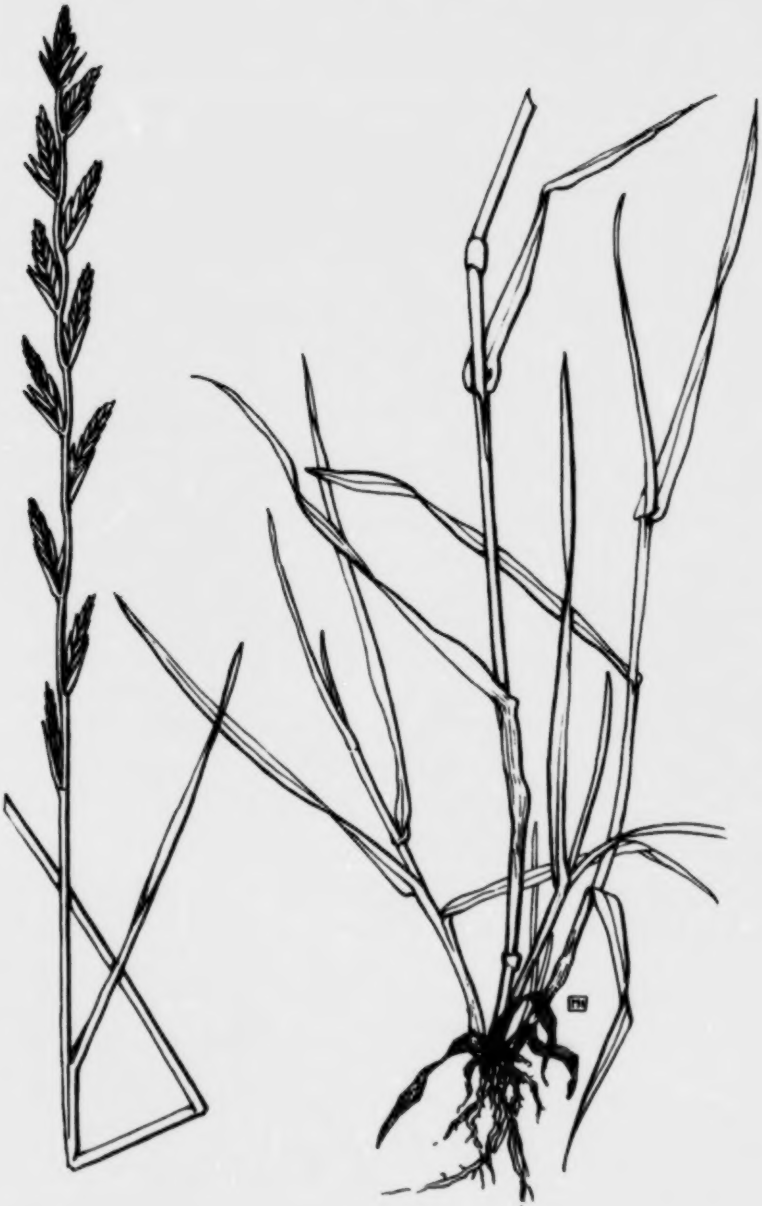


Fig. 13. *Lolium perenne* L. var. *perenne*.

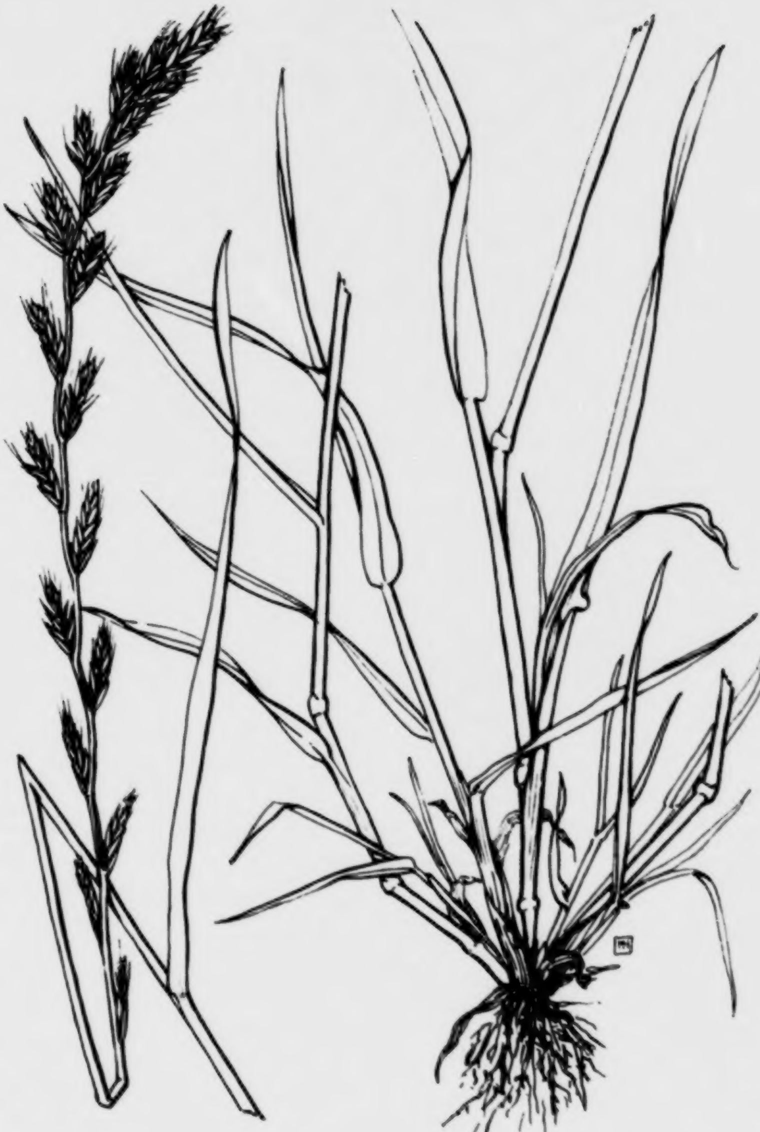


Fig. 14. *Lolium perenne* L. var. *aristatum* Willd.

Lolium remotum **Schrank**—A fragmentary specimen collected by Millman in 1880 in the meadow at the Asylum, London, may belong to this species. It differs from *L. persicum* in its much shorter lemmas and more or less remote spikelets. It is not known elsewhere in Canada.

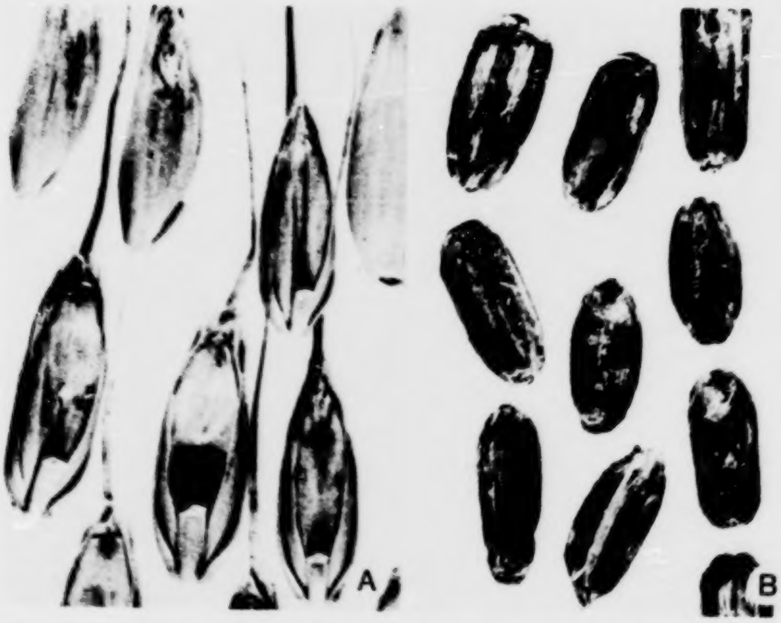


Plate 32. *A*, Florets of *Lolium temulentum* (Ramage 1088); *B*, Caryopses of *L. temulentum* (Ramage 1088).

28. Nardus L.

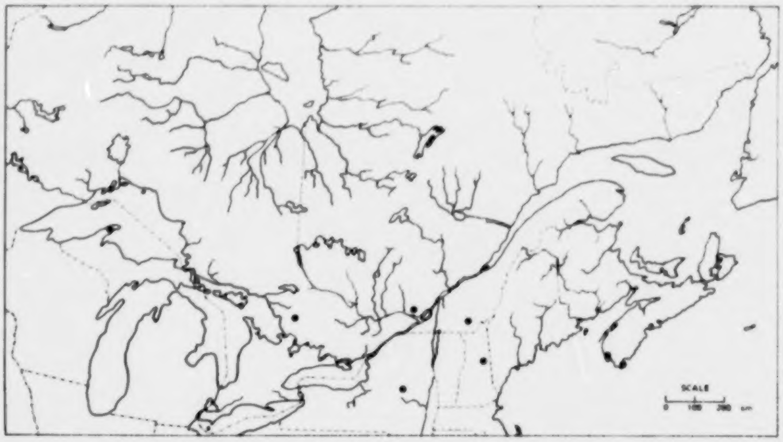
Perennials. Spikelets 1-flowered and set into the 1-sided spike. Glumes absent. Lemma awn-pointed, 3-nerved. Lodicules absent. Stigma slender (not plumose), unbranched.

1. *Nardus stricta* L.

Map 110

moor mat grass, nard

Nardus stricta is known in Ontario from a single collection by Stuart L. Thompson from a "sandy meadow near Huntsville on July 1, 1953" (Shields 1954). The location is described by Montgomery as "near Ilfracombe, Muskoka District; the stand extended 100 yards along both sides of an abandoned road through a sandy pasture, the nearest habitation being one-half mile away." A search in 1964 did not detect the *Nardus*, probably because it was in fact collected near Buck Lake Lodge the Parry



Map 110. *Nardus stricta*. Known occurrence in eastern Canada and the adjacent United States.

Sound District. It did, however, show that other scarce alien grasses occurred in the area, notably *Festuca longifolia* and *Glyceria maxima*. Sporadic introduction of European wild grasses goes back to the early days of settlement before pure seed mixtures of meadow and pasture species were available. The other stations for *Nardus* in Eastern Canada are given by Swales and Bider (1970) and mapped here.

N. stricta is essentially a worthless grass. In northern Europe, where it is particularly abundant in humid sheep-grazed moors, the plants grow deepset in peaty acid turf with their wiry blades bent horizontally at the collar. They become whitish when dry and form conspicuous tufts; thus the species is also known as white bent. Thompson's specimen from Ilfracombe has ripe caryopses but abortive anthers, a condition suggesting agamospermy and the possibility of clonal spread, perhaps started from a single original seed.

29. Koeleria Pers.

Tufted, stiff, slender-culmed perennials. Leaves mainly basal; blades narrow (1–3 mm wide), generally pubescent at least on the outside; sheaths pubescent; ligule short, membranous. Panicles pale, erect, compact, spike-like; axis, branches, and generally the upper part of the culm densely and finely pubescent. Spikelets laterally compressed, usually 2-flowered, disarticulating above the glumes. Glumes acute, keeled, scabrous, scarious-margined; upper glume somewhat longer and broader than the lower. Lemmas acute, sharply keeled, thin, scarious on the margins, shining, scabrous, lacking apparent marginal nerves, awnless. Caryopsis with liquid endosperm.

1. *Koeleria macrantha* (Ledeb.) Schultes (*K. cristata* auct.)

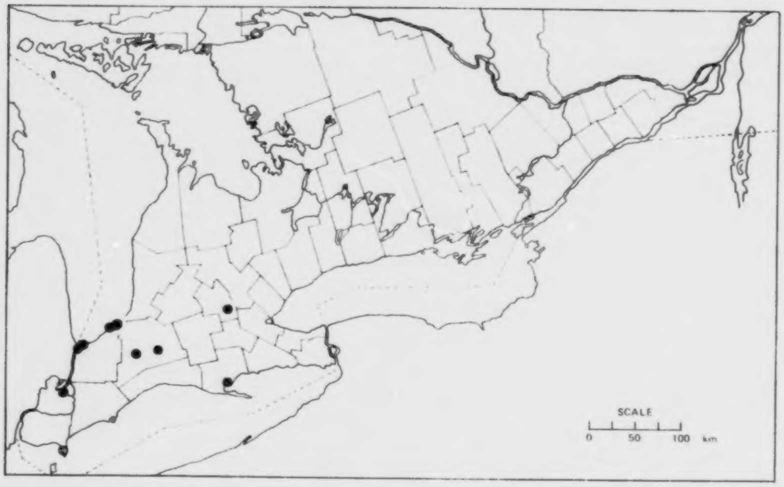
Plate 33, Map 111

prairie June grass

Koeleria macrantha is one of the commonest grasses of the western prairies, where it matures in June and early July. It is very rare in Ontario and, apart from one locality in relic prairie near Thunder Bay, is restricted to open sandy sites in some of the southwestern counties. Specimens have been collected along southern Lake Huron at Grand Bend, Port Franks, Ipperwash Beach, Point Edward, and Sarnia, and in a few localities, such as Strathroy, London, and St. Williams in Middlesex County and in the Haldimand-Norfolk Regional Municipality.

The report from Point Pelee (Dodge 1914) has not been substantiated, and a Wellington County record (Stroud 1941) is based on plants in cultivation at the Ontario Agricultural College (University of Guelph). No specimens are known from some apparently suitable sandy habitats elsewhere (e.g., Windsor, Rondeau (Kent County), and Brantford), and the species is not listed for the Erie Islands (Core 1948) or the Niagara area (Zenkert 1934).

The species is also known from Galt (Cambridge) on the basis of specimens collected by Herriot in 1897, and Herriot and Macoun, apparently together, in 1901. The species has not been redetected in that area for



Map 111. *Koeleria macrantha.*

over half a century and as these specimens were from roadsides and railway embankments, they would seem to represent an introduction that has not survived.

When cultured in isolation, *K. macrantha* sets no seed and seems to be completely self-incompatible; most of the Ontario wild specimens also lack seeds, and at Point Edward no evidence of seedling reproduction was found in the vicinity of aged clumps.

The species is native to both Eurasia and North America; in Europe it was long known as *K. gracilis* Pers. and in North America as *K. cristata* Pers. (or, erroneously, "*K. cristata* (L.) Pers."). *K. cristata* correctly refers to an exclusively European species whose correct name is *K. pyramidata* (Lam.) Beauv., whereas *K. macrantha* takes precedence over the illegitimate *K. gracilis* (Greuter 1968).

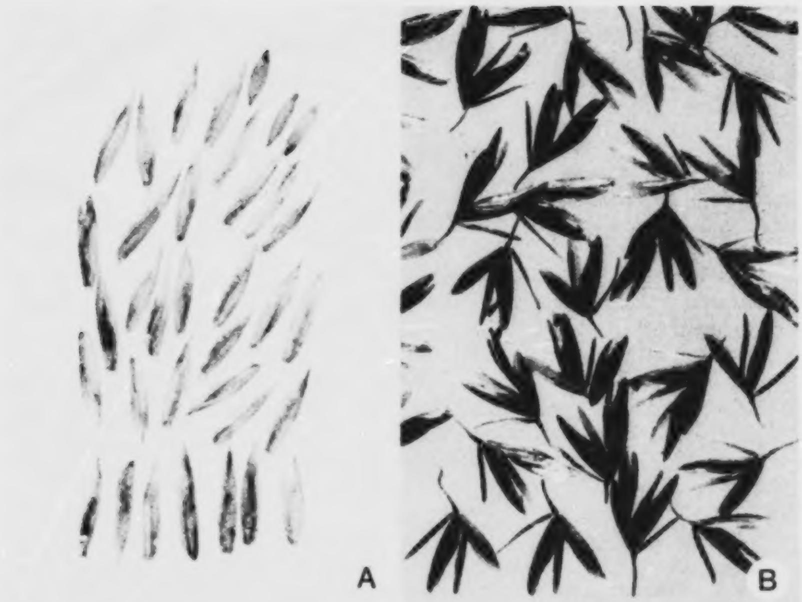


Plate 33. *A*, Florets of *Koeleria macrantha* (Soper and Shields 5039); *B*, Spikelets of *Sphenopholis intermedia* (Dore 17608); *C*, Caryopses of *S. intermedia* (Dore 17608).

30. Sphenopholis Scribner

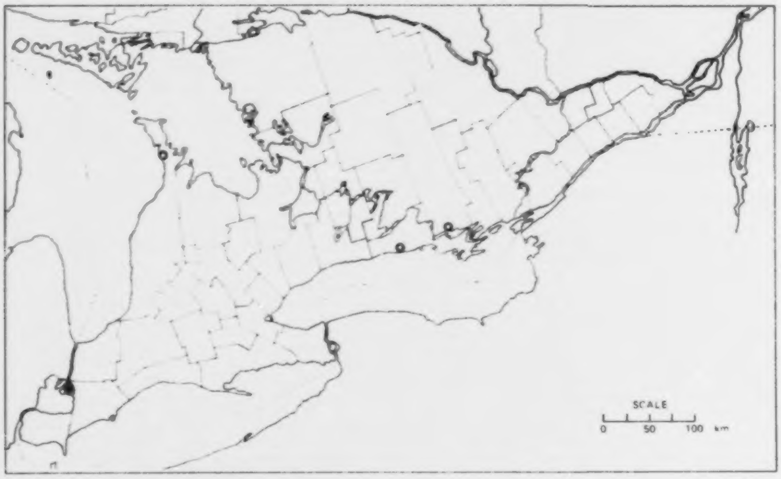
Slender, tufted, small- to medium-sized grasses. Leaf blades flat; ligule membranous, 1–3 mm long, ciliate or lacerate on margin, scabrous on back. Panicles narrow, pale green (maturing to yellow), shiny. Spikelets usually 2-flowered, laterally compressed and shed by disarticulation of the pedicel at a point well below the glumes. Glumes about equal in length (as long as the first floret) but very unequal in width; lower glume narrow (0.1–0.3 mm as folded), 1-nerved; upper glume broad, obovate, 3- to 5-nerved. Lemmas firm, pale-colored, minutely papillose or scabrous, acute but not awned. Palea thin, 2-nerved. Anthers dimorphic. Caryopsis with liquid endosperm.

A. Panicle dense, usually firm, erect, spike-like; upper glume firm throughout with chartaceous margins, somewhat inflated and hood-like (often cracked or wrinkled by pressing), with a curved keel; lower glume (as folded) 0.2–0.3 mm wide, ± equally wide up to the blunt tip; spikelets 2–3.5 mm long .... 1. ***S. obtusata***
A. Panicle lax, soft, somewhat nodding, not erect and spike-like; upper glume with broad soft scarious margins, compressed and not much, if at all, inflated, straight keeled; spikelets 3–5 mm long
  B. Upper glume somewhat pointed; lower glume (as folded) 0.1 mm wide, tapering from middle to sharp tip; lemma smooth, except for scabrous keel; panicle many-spikeleted .... 2. ***S. intermedia***
  B. Upper glume rounded at apex; lower glume (as folded) 0.2–0.3 mm wide, obtuse to subacute; lemma scabrous throughout; panicle few-spikeleted .... 3. ***S. nitida***

1. *Sphenopholis obtusata* (Michaux) Scribner

Map 112

Sphenopholis obtusata is a widespread species in the United States and a characteristic grass of the western Canadian prairies. It has frequently been reported as occurring in Ontario but only two correctly identified specimens have been seen. These were both collected by L. O. Gaiser on Walpole Island, Lambton County, in 1964. Dodge (1915) had recorded the species for the delta islands of the St. Clair River, one of which is Walpole Island, but some of his records appear to be misidentifications of *K. macrantha*.



Map 112. *Sphenopholis obtusata.*

The many other specimens preserved in herbaria under *S. obtusata* have all had to be revised to *S. intermedia*, but the species may have occurred elsewhere in the province at one time. Macoun (1888) refers to it (under the name *Eatonia obtusata*) as being rather rare in Ontario and gives 3 localities: Belleville, near Grafton in Northumberland County, and Red Bay on Lake Huron. Its disappearance from a site in Erie County, around Buffalo, New York, is mentioned by Zenkert (1934).

2. *Sphenopholis intermedia* (Rydb.) Rydb.

Plate 33, Maps 113 and 114

slender wedge grass

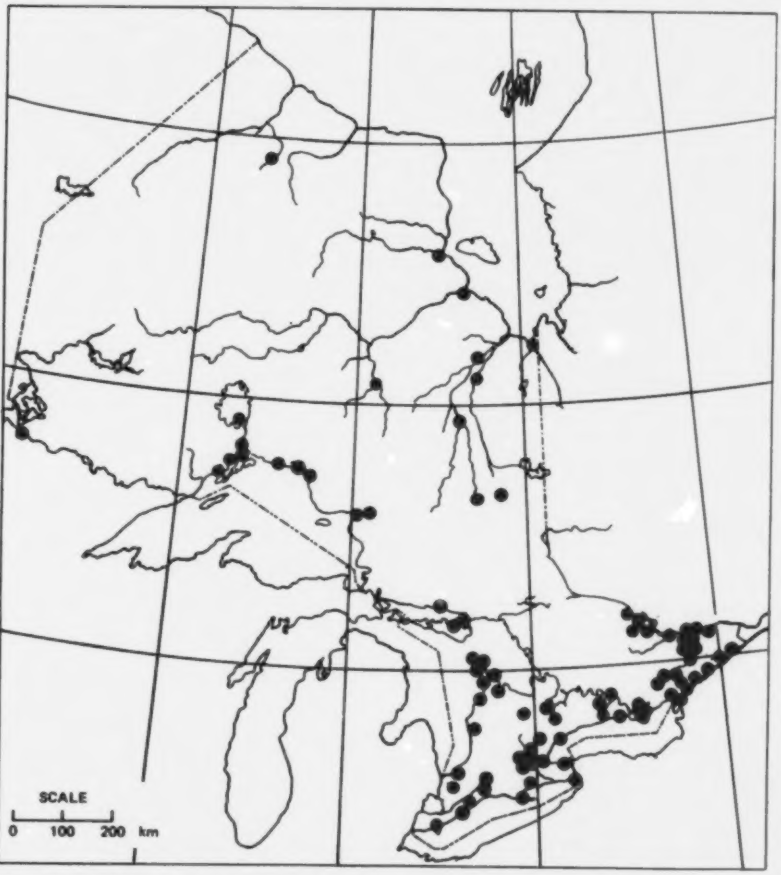
A rather widespread grass across Canada, *Sphenopholis intermedia* is never abundant, or at least not conspicuously so, in its normal habitats. These are damp woodlands, often on rotting stumps or logs, and dripping-wet cliffs, where the plants are weak and single-stemmed. When forest soil is torn up, however, wedge grass may arise in surprising abundance, presumably from long-dormant seed. It then appears with slender stems flowering in the first year, like an annual, but it grows taller and tillers out into sturdy clumps in the second and subsequent years. Under good growth conditions, new stems continue to form during the season; panicles with shed spikelets and others in full flower may be present from the same tuft. The ripe spikelets are rather light and tend to drift on the wind, which may account for the relatively wide distribution of the species.

Older specimens and published records of *S. intermedia* often appear under the name *S. pallens*, misapplied to this species. Erdman (1965) regards *S. intermedia* as a variety of *S. obtusata* (*S. obtusata* var. *major* (Torrey) Erdman) because of numerous intermediates found in the southern and southwestern United States. In the east and north the two species appear to remain distinct.

In Ontario, plants with pubescent foliage are much less frequent than hairless plants and seem to have a more southerly distribution. They are distinguished as a variety.

Leaf blades and upper sheaths hairless between the veins, finely scabrous on veins and margins .... a. var. ***intermedia***

Leaf blades and sheaths all pilose throughout .... b. var. ***pilosa***



Map 113. ***Sphenopholis intermedia*** var. ***intermedia.***

2a. var. *intermedia*

Var. *intermedia* is widely distributed in Ontario, and rather common in the Bruce Peninsula and on the rocky northeastern side of Manitoulin Island; it recurs along the northern shore of Lake Superior from Michipicoten to Lake Nipigon and then is found again at Rainy River. More distant are the numerous stations along the rivers of the northern drainage into James and Hudson bays. No specimens have been seen from rather well collected areas such as some of the eastern counties, the upper Ottawa Valley, the Algonquin highlands, Windsor, Sarnia, Georgian Bay, and northern Lake Huron.

2b. var. *pilosa* Dore

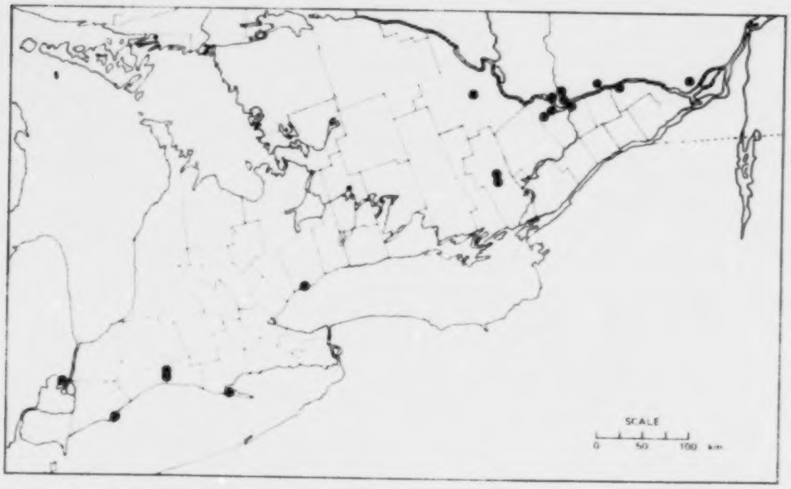
The pilosity of the blades and sheaths of var. *pilosa* is of thin and sparse hairs but visible to the naked eye when held up to the light; otherwise the plants do not differ in morphology or habitat from those of the typical hairless or scabrous variety. Twelve of the 142 Ontario specimens of *S. intermedia* examined are referable to var. *pilosa*. These are confined to the southern counties, the Ottawa Valley (also in adjacent Quebec), central Frontenac County, Swansea, Long Point, the St. Thomas area, and Rondeau. They are all near localities of var. *intermedia*. Seed progeny are consistent in pilosity; chromosome number is the same as var. *intermedia*, $2n = 14$, counted on plants of var. *pilosa* from Harwood Plains, Ottawa-Carleton Regional Municipality (Bowden 1960*b*), and from Jessop Falls, Prescott County (Moore et al. 1976).

3. *Sphenopholis nitida* (Biehler) Scribner

Map 115

Sphenopholis nitida is rare in Canada and for a long time was known only from one specimen, collected in 1892 near Niagara Falls. However, in 1955 it was found at Hamilton in natural woods in the Botanical Garden area. An immature specimen that may belong to this species was collected in young hardwoods in 1958 near Jarvis, Haldimand-Norfolk Region. The map provided by Erdman (1965) shows that the species occurs in neighboring New York State.

The report for Waterloo County (Montgomery 1945) is erroneous, and is based on a misidentified specimen of *S. intermedia* from Galt (Cambridge).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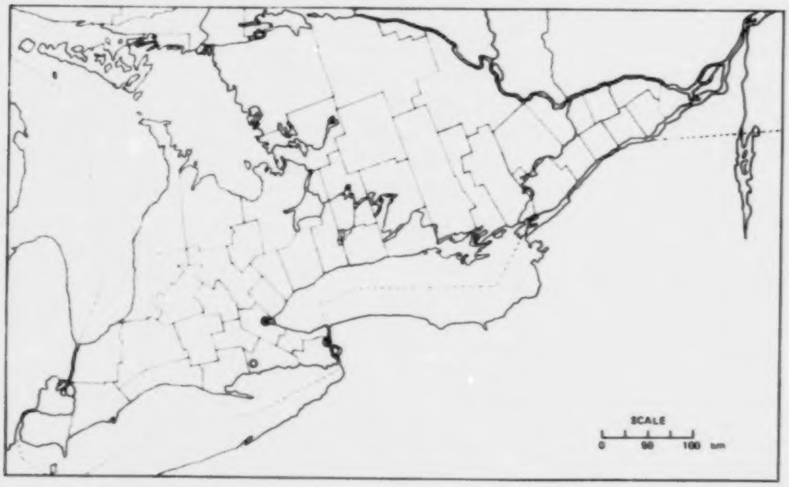
Map 114. *Sphenopholis intermedia* var. *pilosa*. All known Canadian records from the area covered by the map are plotted.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Map 115. *Sphenopholis nitida*.

31. Trisetum Pers.

Tufted perennial grasses. Leaf sheaths generally hairy; ligule membranous. Panicles spike-like or loosely contracted. Spikelets with 2–5 florets. Glumes about equal in length or the upper slightly longer than the lower, persisting on the pedicels after maturity. Lemma awned from the back or awnless, acute, with the membranous tip sometimes divided into 2 slender soft teeth. Rachilla and callus with straight hairs. Endosperm in mature grains remaining fluid for many years.

A. Panicle dense, spike-like, erect; lemmas with a conspicuous geniculate awn
  B. Plants 10–30 cm high; panicle short, compact, not interrupted, 3–4 times as long as thick, rounded at the top; glumes 3.5–4.5 mm long, one-quarter as wide (when folded), not extending to top of the florets; lemmas brightly colored with purple and brown; arctic species .... 1. ***T. spicatum***
  B. Plants 20–50 cm high; panicle slender, looser, and somewhat interrupted especially toward the base, about 10 times as long as thick, tapering to tip; glumes 4.5–5.5 mm long, one-fifth as wide (when folded), extending almost to top of the florets; lemmas pale green, drying to a light straw color; boreal species .... 2. ***T. triflorum***
A. Panicle with loose ascending branches, nodding
  C. Lemmas awnless or with a minute straight awn; spikelets light green; native species .... 3. ***T. melicoides***
  C. Lemmas with a conspicuous geniculate awn; spikelets golden green or tinged with purple; introduced species .... 4. ***T. flavescens***

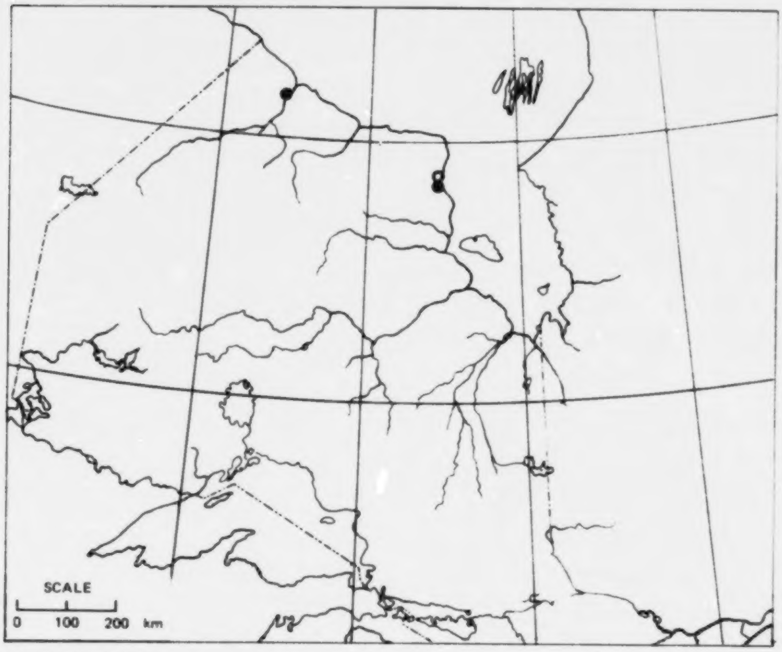
1. *Trisetum spicatum* (L.) Richter

Map 116

spike trisetum

Hitchcock and Chase (1951) and other manuals include this and the following species within their broad concepts of *Trisetum spicatum*. The treatment by Böcher (1959) and Löve and Löve (1965) is followed here, restricting *T. spicatum* to the widespread Eurasian and American tetraploid populations. These are represented in eastern North America by the circumpolar subsp. *spicatum*, which is widespread in arctic tundra (Hultén 1959, 1968). In Ontario, it is known only from near Hudson and James bays.

Eastern North American specimens have been distinguished from Eurasian plants as var. *maidenii* (Gand.) Fernald, a separation that does not seem to be tenable (Hultén 1959).



Map 116. *Trisetum spicatum*.

2. *Trisetum triflorum* (Bigelow) A. & D. Löve (*T. spicatum* auct. pro parte)

Plate 34, Maps 117 and 118

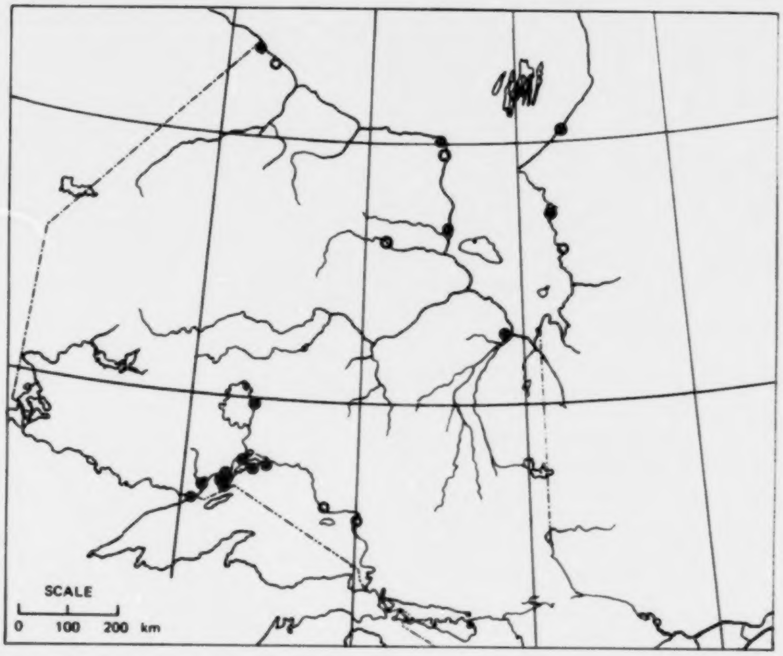
soft-hairy spike trisetum

On the evidence of morphology and the hexaploid chromosome level, *Trisetum triflorum* is recognized at specific rank rather than included in *T. spicatum*. In that species it is treated either as two varieties (var. *molle* (A. Gray) Beal and var. *pilosiglume* Fernald), as in most manuals, or else as two subspecies (subsp. *molle* Hultén and subsp. *pilosiglume* (Fernald) Hultén) as Hultén (1959) prefers.

Glumes pilose on sides and on keel	a. subsp. ***triflorum***
Glumes smooth or scabrous, sometimes hispid on keel	b. subsp. ***molle***

2a. subsp. *triflorum* (*T. spicatum* var. *pilosiglume* Fernald)

Subspecies *triflorum* has peculiar disjunct distribution in eastern North America (Hultén 1959, 1962, p. 60), and in Ontario it is concentrated in two general areas, around the head of Lake Superior and near James Bay. It is somewhat variable. Tall plants with pale, slender panicles are known from Agate Island, Lake Superior, although short plants (10–15 cm high) with stubby, deeply colored panicles also occur. The latter plants resemble *T. spicatum* and have been found on Sand Island and Copper Island in Lake Superior and at Cape Henrietta Maria.

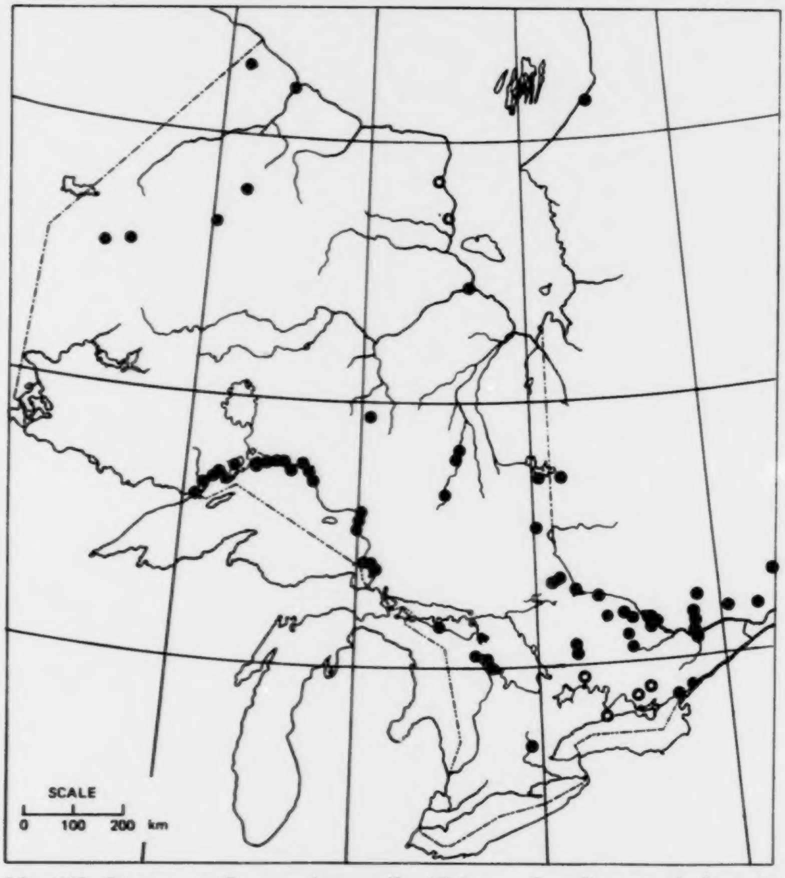


Map 117. *Trisetum triflorum* subsp. *triflorum*. All known Canadian records from the area covered by the map are plotted.

2b. subsp. *molle* (Hultén) A. & D. Löve (*T. spicatum* var. *molle* (Michaux) Beal)

Subsp. *molle* occurs in the same areas as subsp. *triflorum*, but in Ontario and generally across North America it is more widespread and is particularly characteristic of the boreal forest, often appearing in crevices of rocks on exposed shores of lakes and rivers. It is abundant along the north shore of Lake Superior and through the Clay Belt (Baldwin 1958) wherever appropriate habitats occur; elsewhere the plants are more scattered, from the Bruce Peninsula to eastern Ontario, where they occur on limestone and on granite rock. In the far northwest of the province, the subspecies is found on eroded clay banks or sand ridges.

There are also some plants of subsp. *molle* on the north shore of Lake Superior with some of the characters of *T. spicatum*, such as low stature (<15 cm) and colored spikelets. Butters and Abbe (1953) suggested that these might be hybrids. Another distinctive variant, more common in far northern collections from outside Ontario, is one with coarse, apparently succulent, and strongly pilose culms. This variant may be an edaphic



Map 118. *Trisetum triflorum* subsp. *molle*. All known Canadian records from the area covered by the map are plotted.

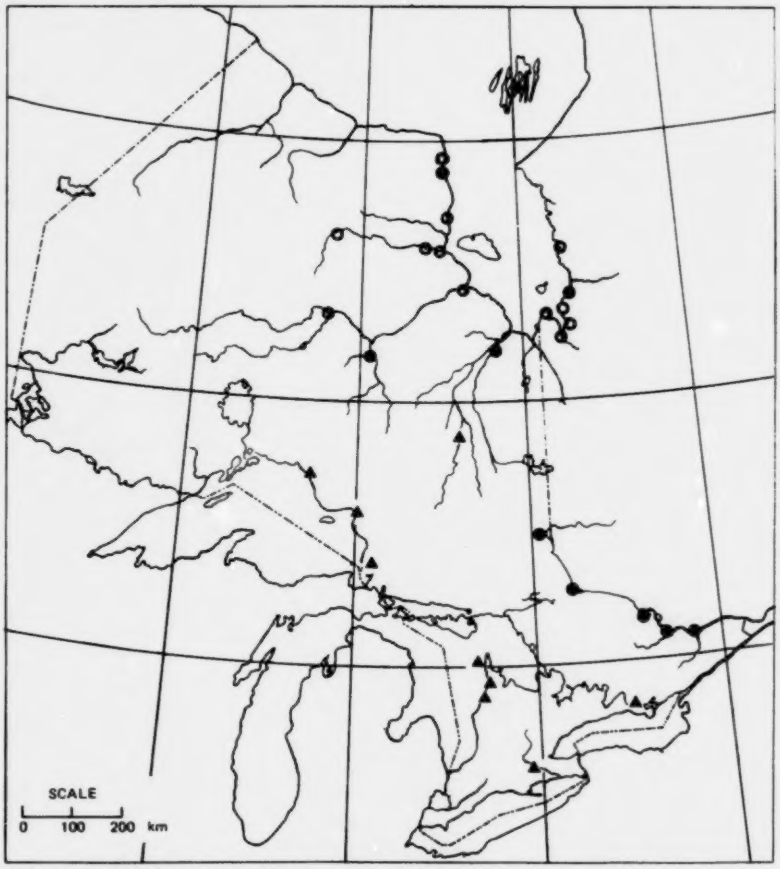
response to locally rich soil conditions. A specimen of this type is known from a sandy beach on Patterson Island, Lake Superior; it has stems 30–60 cm high, panicles 8–15 cm long, bronze spikelets.

3. *Trisetum melicoides* (Michaux) Vasey ex Scribner

Plate 34, Map 119

melica-like trisetum

A native grass, *Trisetum melicoides* is very similar in appearance to *T. flavescens*, a European forage species. The native species might therefore merit investigation of its forage value.



Map 119. ***Trisetum melicoides*** var. *melicoides* (•) and var. *majus* (▲).

Leaf sheaths and blades hairless	a. var. ***melicoides***
Leaf sheaths and upper side of blades pilose	b. var. ***majus***

3a. var. *melicoides*

Var. *melicoides* is more northerly and easterly in its Ontario distribution than var. *majus*. It is found along the Ottawa River and around James Bay.

3b. var. *majus* (A. Gray) A.S. Hitchc.

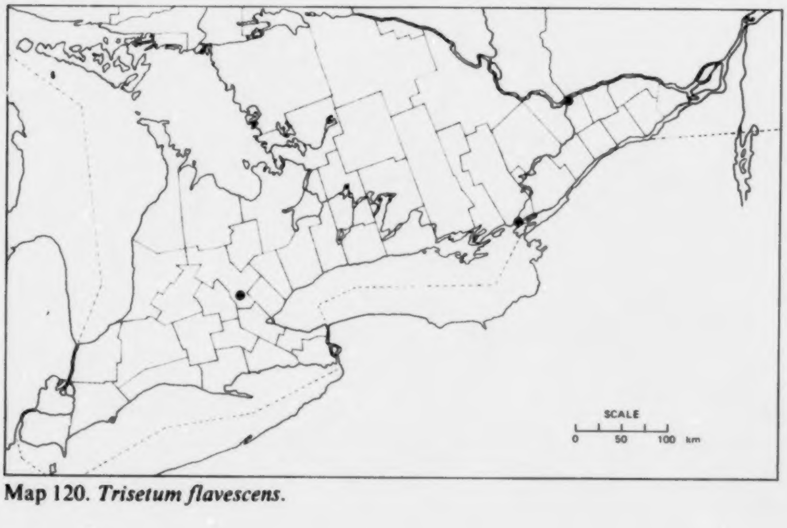
The distribution of var. *majus* in Ontario appears to be related to the Great Lakes. The subspecies occurs from the Bruce Peninsula to the Lake Superior shore as far west as Heron Bay. Old collections from Galt (Cambridge) and Hastings County, both made in 1897, seem to represent localized occurrences.

4. *Trisetum flavescens* (L). Beauv.

Plate 34, Map 120

golden oat grass, yellow trisetum

In northern Europe, where it is abundant, *Trisetum flavescens* is regarded as a useful pasture and hay species. It was introduced early into Canada and recommended in agricultural publications for forage purposes. It does not, however, persist in Ontario and no specimens are known to have been collected except in recently seeded meadows.



Map 120. *Trisetum flavescens*.

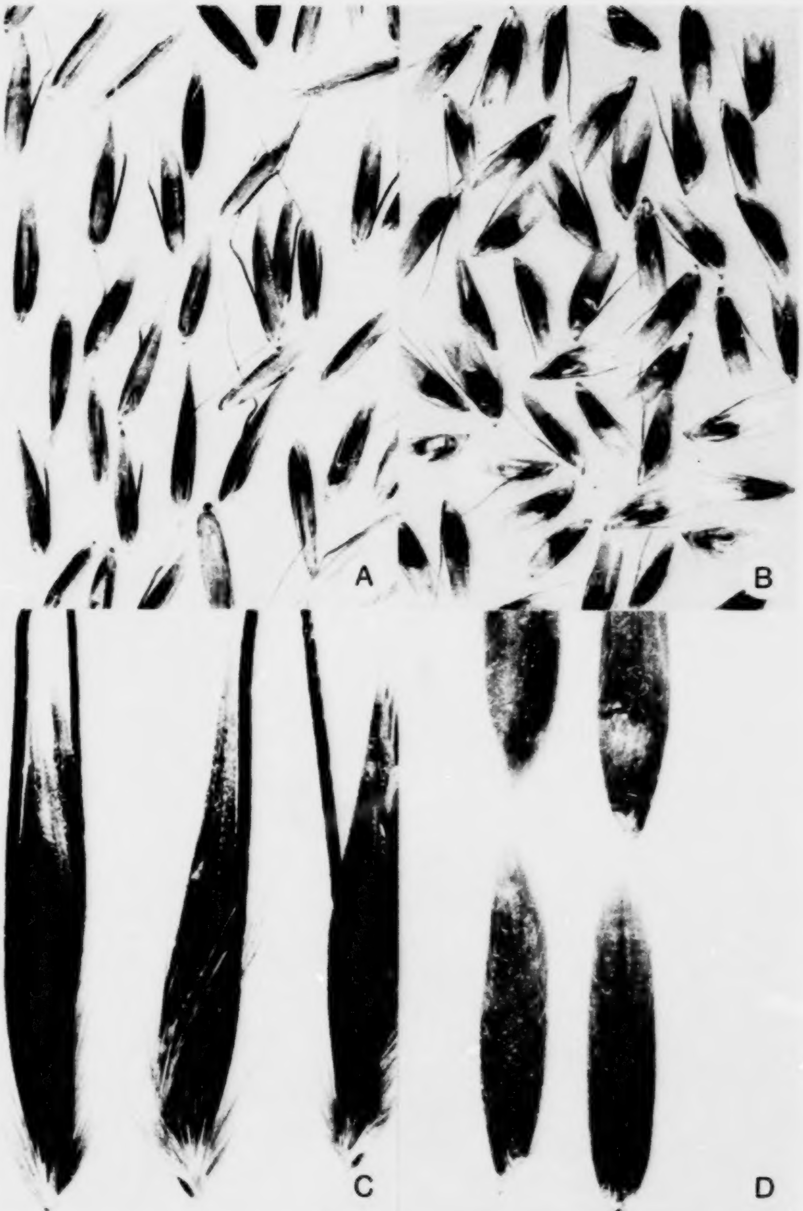


Plate 34. *A*, Spikelets of *Trisetum triflorum* subsp. *triflorum* (Lepage 34017); *B*, Florets of *T. triflorum* subsp. *molle* (Dore 18409); *C*, Florets of *T. melicoides* var. *melicoides* (Dore 22531); *D*, Florets of *T. flavescens* (commercial sample from Sweden).

32. Deschampsia Beauv.

Slender-culmed, medium-sized, noncreeping perennials. Foliage hairless; blades narrow in a basal tuft; ligule membranous. Panicles long-exserted from the leaves. Spikelets shining, often purplish, 2-flowered (rarely 3-flowered), disarticulating above the glumes; rachilla prolonged above the upper floret as a bearded appendage. Glumes about equal, acutely tapered, membranous, enclosing the florets. Lemmas thin, membranous, toothed at apex, bearded on callus, bearing a slender awn from near the base.

Leaf blades flexuous, setaceous, essentially terete and less than 1 mm diam; awns twisted in lower portion, extending well beyond glumes; lemmas scabrous; sheaths scabrous; ligule less than 1 mm long, blunt, thick-membranous .... 1. ***D. flexuosa***

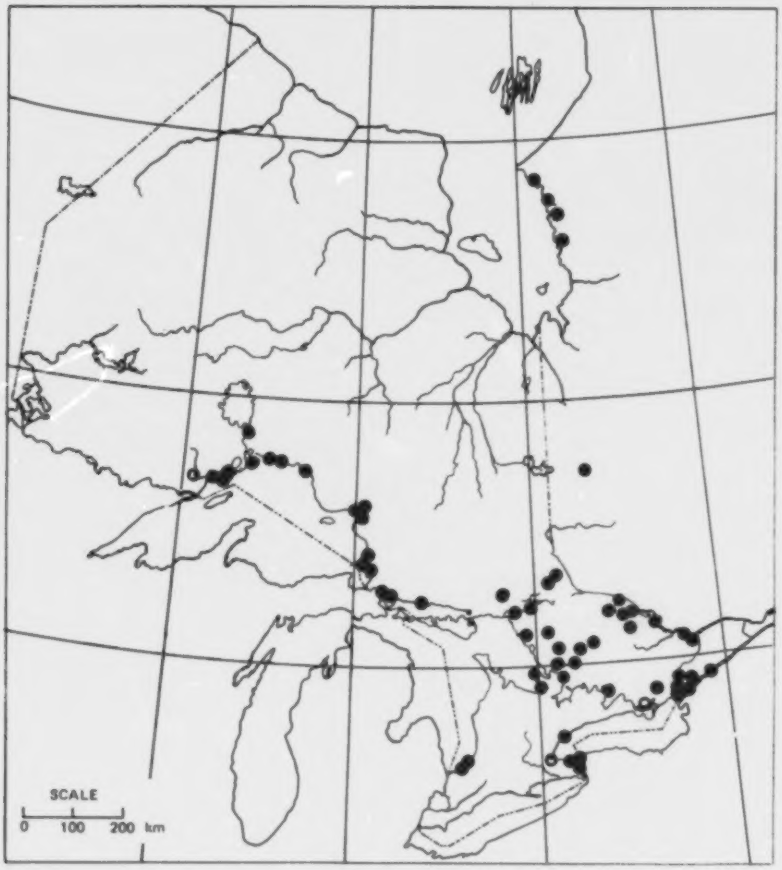
Leaf blades rather rigid, flat or conduplicate, 1–3 mm wide, ridged on upper surface; awns straight, not much longer than lemma and not conspicuously extending beyond glumes; lemmas essentially smooth; sheaths smooth; ligule 3–6 mm long, acute, thin-membranous .... 2. ***D. caespitosa***

1. *Deschampsia flexuosa* (L.) Trin.

Plate 35, Map 121

crinkled hair grass

Deschampsia flexuosa is an abundant species of dry acidic habitats in certain parts of the Precambrian Shield, ranging from southern Frontenac and Leeds counties, across Muskoka and Parry Sound districts to Algonquin Park and Temagami. Along the northern shores of lakes Huron and Superior, it is characteristic of granitic outcrops and sandy barrens, where it grows among lichens and blueberries, often in the open jack pine forests. Around Sudbury it is one of the few plants to survive the smelter fumes. However, there are large parts of the Shield from which it seems to be absent, e.g., northern Hastings, Frontenac, and Renfrew counties, and all of adjoining western Quebec. It is not found in the Clay Belt of Ontario or on the vast terrain of the Rainy River and Kenora districts, where suitable habitats appear to exist. The most westerly record, "20 miles up the Kaministiqua" (Macoun 1888), Thunder Bay District, is away from the Lake Superior shore influence, but it is not supported by a specimen.



Map 121. *Deschampsia flexuosa.* All known Canadian records from the area covered by the map are plotted.

In general, *D. flexuosa* is absent from the calcareous soils in the province but occurs locally in sand barrens along major shores like Constance Bay on the Ottawa River, Grand Bend to Kettle Point on Lake Huron, and Wasaga Beach on Georgian Bay. At these places the species seems to be native but only recently discovered. Patches around western Lake Ontario, however, were detected earlier but may now be extinct.

The species is abundant from James Bay eastward across northern Quebec and down through the Maritime Provinces, but in southwestern Quebec it tends to be local, and grows in isolation on the top of several of the Monteregian Hills, as well as at King Mountain (opposite Ottawa), and at Mount Martin (opposite Deep River). In Ontario the species is found at Thomas Mountain, Golden Lake, and is abundant in the Frontenac Axis and southwards to the Adirondacks in New York State.

The slender, wiry leaves tend to persist as a dry tuft around the base of the plant, which pulls out of the loose soil easily. On this account, it is of no forage value to wild or domesticated grazing animals. Some have speculated that it might make a good turf grass for poor soils.

2. *Deschampsia caespitosa* (L.) Beauv.

Plate 35, Maps 122–125

tufted hair grass

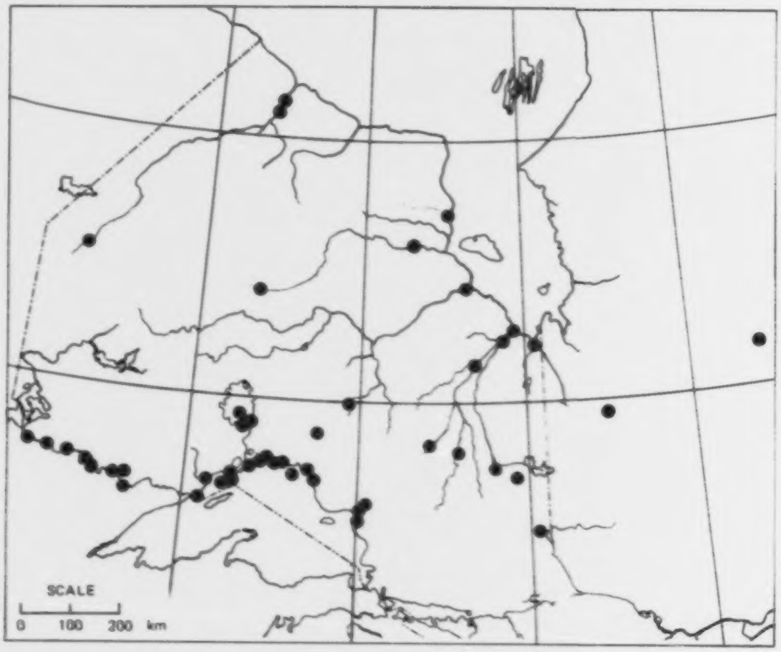
Deschampsia caespitosa is part of a species complex widely distributed throughout the northern hemisphere and extending into the southern hemisphere. Its taxonomy and nomenclature are still unsatisfactory, despite experimental studies (e.g., Kawano 1963, 1966; Putman 1971). Three distinctive groups of populations are, however, recognizable in Ontario.

A. Culms 65–170 cm high, more than 2 mm diam at base; basal leaf blades 15–50 cm long; panicle 25–45 cm long; spikelets 2–3 mm long; introduced from Europe, a garden escape or along roadsides .... c. var. ***parviflora***
A. Culms 7–75 cm high, less than 2.5 mm diam at base; basal leaf blades mainly 3–30 cm long; panicle 5–20 cm long; native
  B. Spikelets 3–4.5 mm long, usually 2-flowered; flood shores of rivers and lakes .... a. var. ***caespitosa***
  B. Spikelets 4.5–7 mm long, 2- or often 3-flowered; northern shores of James and Hudson bays .... b. var. ***maritima***

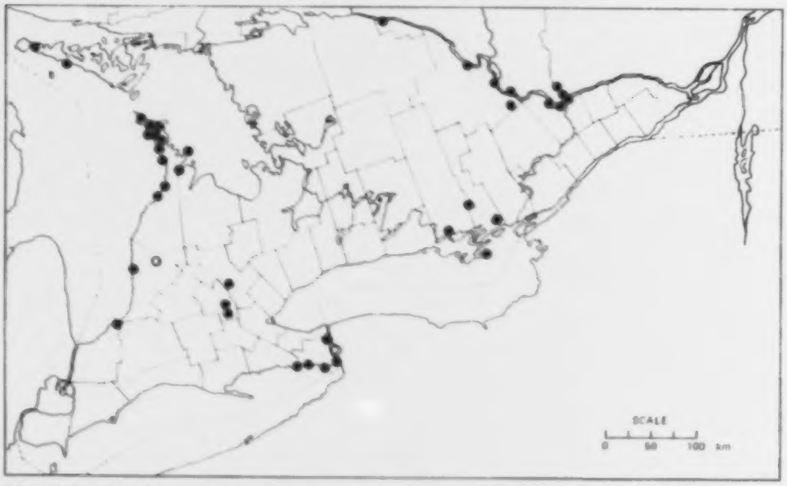
2a. var. *caespitosa* (*D. caespitosa* var. *glauca* (Hartman) Lindman)

Var. *caespitosa* is widely distributed across Eurasia and North America. Contrary to Fernald's suggestion, no consistent differences appear to exist between the plants in the two continents. Those corresponding to the characteristics of var. *glauca* occur throughout the range of var. *caespitosa* in the broad sense used here.

Var. *caespitosa* is particularly prevalent in moist grassland in the Prairie Provinces, but in Ontario it is confined almost entirely to shoreline habitats in a few areas. These are usually places where flood levels cover its plants completely in the spring, or where high waves wash their base in summer. The main abundance of the variety is on the rock beaches of parts



Map 122. *Deschampsia caespitosa* var. *caespitosa*. Distribution in northern Ontario and northern Quebec; for distribution in southern Ontario, see Map 123.



Map 123. *Deschampsia caespitosa* var. *caespitosa*. Distribution in southern Ontario and adjacent Quebec; for distribution in northern Ontario, see Map 122.

of the Great Lakes, but it also occurs along a few rivers, such as the Grand and the Rainy, as well as the Ottawa River from Lake Temiskaming down as far as the city of Ottawa.

It is, however, absent from many other streams in southern Ontario, such as the Rideau, Mississippi, Trent, and Thames. It grows along the shores of small lakes only in the upper portion of the Bruce Peninsula and on the marl flat of Marl Lake in Hastings County, where it may be introduced. Although its natural dispersal is clearly related to shorelines, the riparian habitat is not essential for its growth. For instance, specimens from Longlac in the Thunder Bay District were collected on a railroad embankment, and at Arnprior, Renfrew County, it grows among impurities in highway seedings. Under cultivation it develops vigorously from seed and produces much taller and more ample plants than in the wild habitats. It would appear to have potential value as a forage grass.

Specimens with a few proliferous spikelets in the panicle have been collected at Grand Bend, Huron County, and at Mackey on the Ottawa River in Renfrew County. Such proliferation may be associated with delayed flowering induced by irregular flooding. Proliferation is rather common in northern Europe and Greenland but has not previously been reported in Canada.

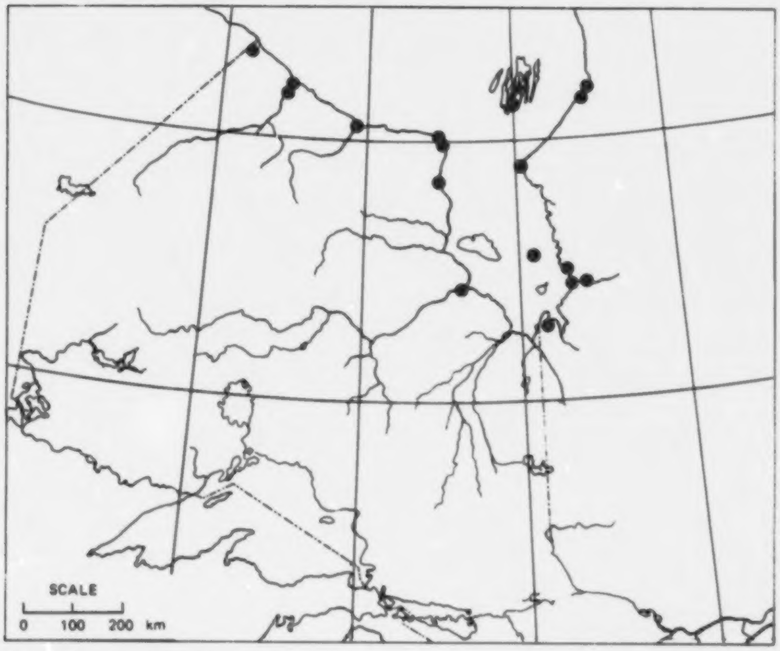
Plants with pale green rather that the usual purplish panicles are found scattered throughout the range of the variety. Such plants contrast conspicuously when in the preflowering and flowering stages, but lose much of their distinctness at maturity or when made into dried specimens. They have been called forma *pallida* (Koch) Holmberg (var. *pallida* (Koch) Gren. & Godron) and have been collected in Ontario at St. Ignace Island in northern Lake Superior and at Shakespeare Island in Lake Nipigon. Plants grown from seeds collected at Shakespeare Island bore green panicles similar to the parent, whereas seedlings from a nearby purple plant segregated into purple and green.

2b. var. *maritima* Vasey (*D. caespitosa* var. *littoralis* auct. amer. pro parte; *D. caespitosa* var. *abbei* Boivin).

Var. *maritima*, from the shores of Hudson and James bays in Ontario, is a large-spikeleted variant that has been included in a number of different Eurasian taxa. Treated as a localized variety occurring in coastal locations extending around northern Quebec to the Gulf of St. Lawrence, the correct name appears to be var. *maritima* (McNeill and Dore 1977).

2c. var. *parviflora* (Thuill.) Cosson & Germ.

Var. *parviflora*, the only introduced variety in Ontario, is easily recognized by its tall ample growth, dense tussock formation, and occurrence in habitats influenced by man. It was found a few kilometres northwest of Stratford in 1947, where it was strongly established along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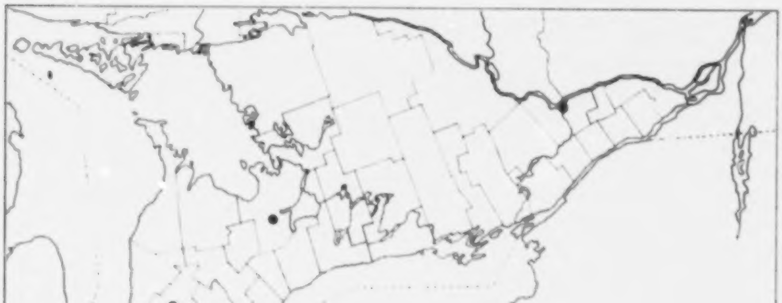
Map 124. *Deschampsia caespitosa* var. *maritima*. All known records from the area covered by the map are plotted.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Map 125. *Deschampsia caespitosa* var. *parviflora*.

Highway 8. In 1975, it was collected in sandy ditches southeast of Angus in Simcoe County. Plants that persisted for many years in an old woodland garden at Ottawa are apparently extinct now. Under comparative cultivation, var. *parviflora* blooms about a month later than native plants of var. *caespitosa*. It is a rather ornamental grass, established at scattered localities in Eastern Canada and the United States.

Vahlodea atropurpurea **(Wahlenb.) Fries (*Deschampsia atropurpurea* (Wahlenb.) Scheele)**—This species has recently been discovered in Ontario in the Hudson Bay lowlands (Riley 1979). It is distinguishable from species of *Deschampsia* by being less densely tufted, having the glumes overtopping the florets and the lemma awn inserted about the middle.

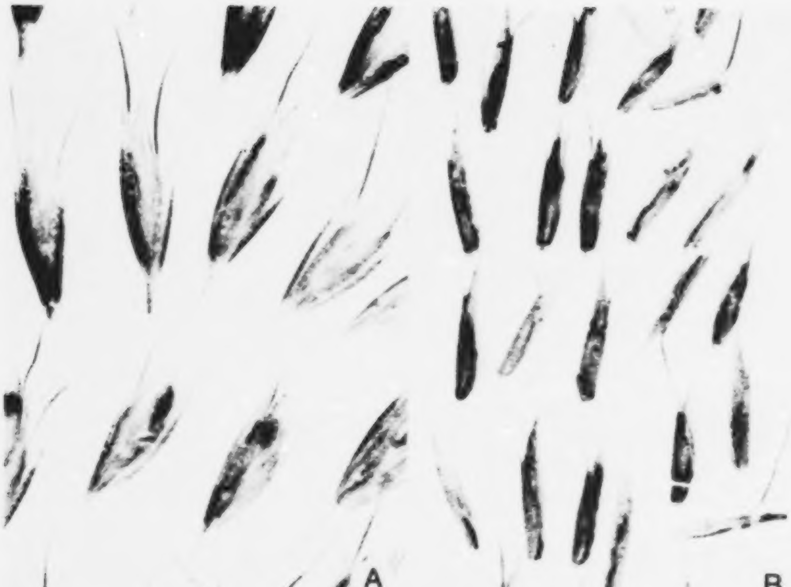


Plate 35. *A*, Florets of *Deschampsia flexuosa* (Dore 21051); *B*, Florets of *D. caespitosa* (Garton 6665); *C*, Florets of *Avena fatua* (Dore and Johnston 9060); *D*, Caryopses of *A. fatua* (Boivin and Alex 10106).

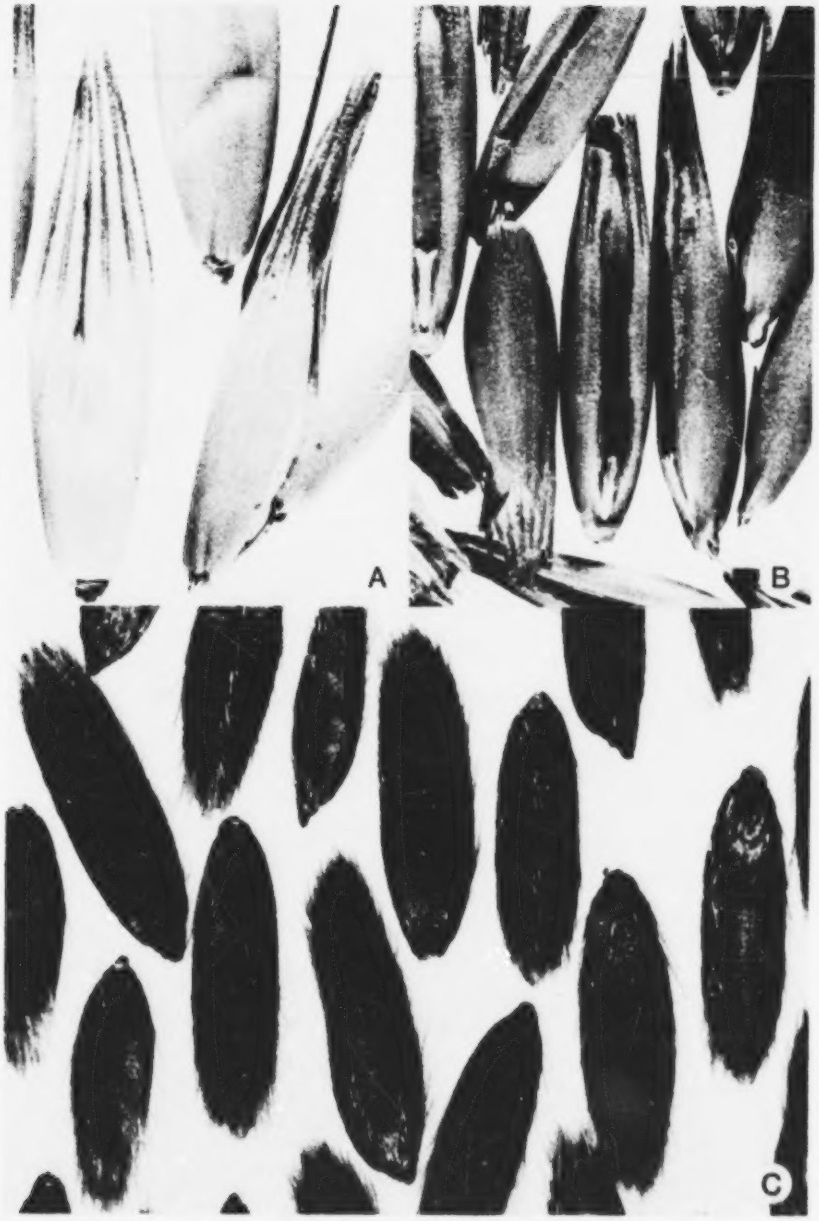


Plate 36. *A*, Florets of *Avena sativa* (Dore and Cody 6570); *B*, Threshed florets of *A. sativa* cv. Erban (cultivated at Ottawa); *C*, Caryopses of *A. sativa* cv. Erban (cultivated at Ottawa).

33. Avena L.

Annual grasses. Leaves hairless; auricles absent; ligule membranous, long, whitish. Panicles large, lax. Spikelets large, 2- to 3-flowered, usually pendulous on slender panicle branches. Glumes wide, equal in size, hairless, several-nerved, enclosing the body of the florets. Lemmas smooth, tough, enclosing the hairy grain, awnless or with a large twisted awn inserted about the middle of the back; rachilla and sometimes the back of the lemma hairy.

Lemmas generally hairy on the back with long, slender, twisted, often brownish hairs, and with a ring of stiff, usually brown, bristle-like hairs from the callus; awn strong, stiff, and twisted in its lower part, which equals or exceeds the tip of the lemma; upper part of awn more slender and about twice as long as lower part; florets readily separating at maturity leaving a circular scar or "suckermouth" at the callus .... 1. ***A. fatua***

Lemmas hairless; awn absent, or short and straight, if surpassing the lemma, not strongly twisted in its lower portion; florets not readily separating from the spikelet nor from each other, when broken apart mechanically a portion of the rachilla remaining attached to the callus .... 2. ***A. sativa***

1. *Avena fatua* L.

Fig. 15, Plate 35, Map 126

wild oat

The wild oat, *Avena fatua*, can usually be distinguished from cultivated oats by the characters given in the key. The "suckermouth," a circular scar formed by natural corky abscission tissue at the base of the lemma (at least of the lowermost floret), is the simplest character for practical recognition. It illustrates the basic feature that makes wild oat a weed and not a domesticated plant, by allowing its grains to escape harvesting by dropping to the soil unaided. The additional physiological characteristics of dormancy and winterhardiness of the grain cannot be detected by any structural feature.

In some cultivars of oats the awns are well developed and the awn distinction from wild oat breaks down. Baum (1968, 1969*a*, 1969*b*) suggests that the two species are more satisfactorily separated by the microscopic characters of lodicule and epiblast shape. In *A. fatua* the lemma sometimes lacks hairs on the back and various color forms exist (*see* Lindsay 1956).

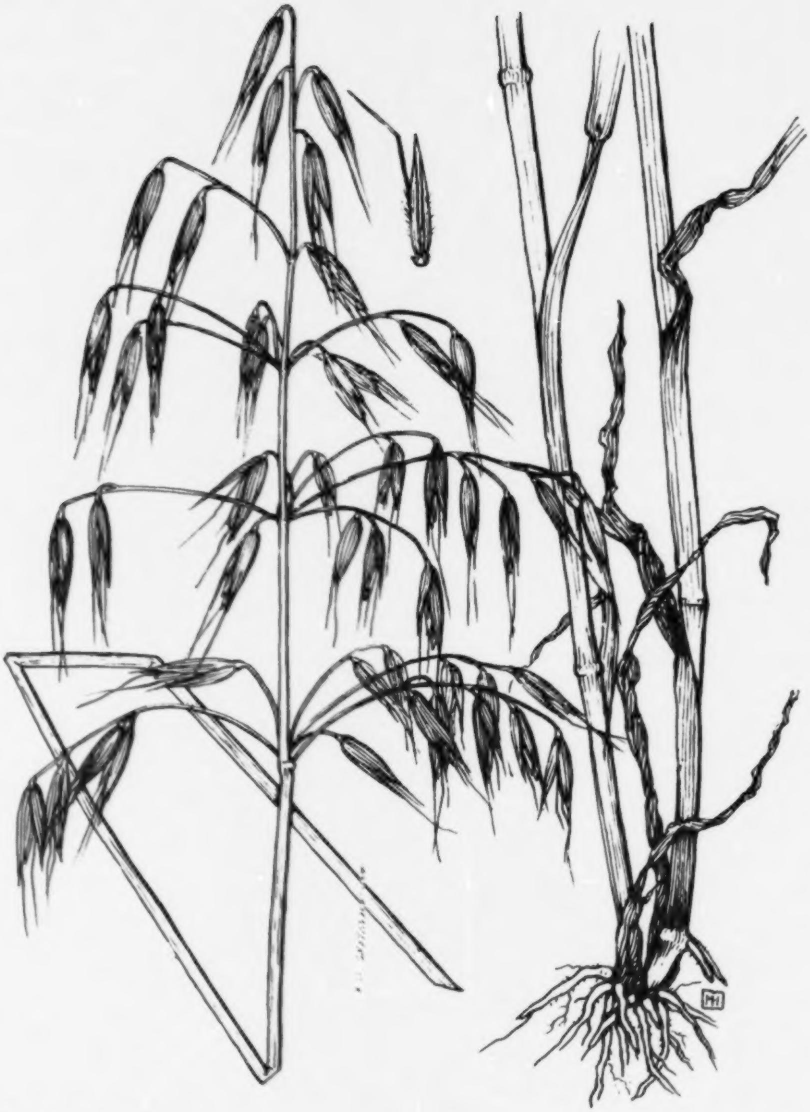
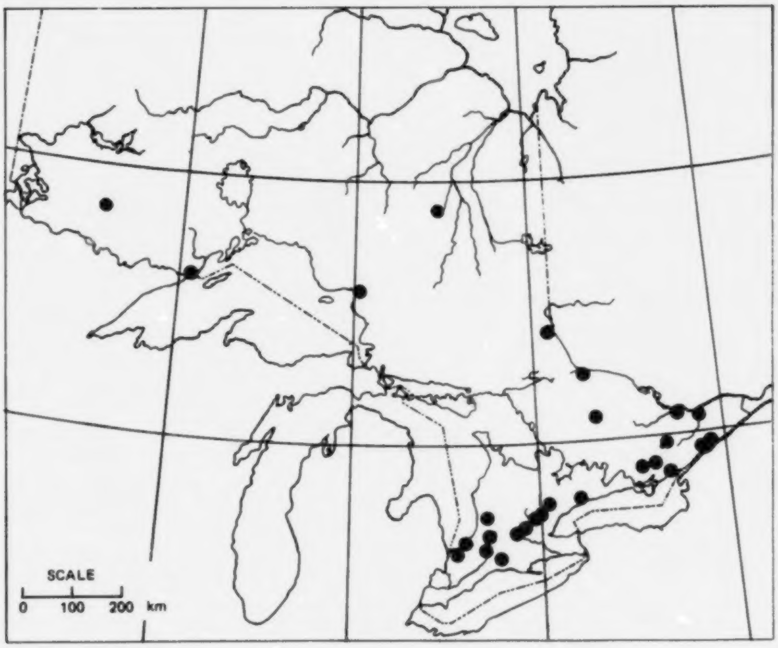


Fig. 15. *Avena fatua* L.



Map 126. *Avena fatua.*

In Ontario, wild oat seems to be able to persist as a weed only in the southern counties west of Toronto where winter wheat is grown. The records mapped by Baum (1968) from localities in northern Ontario such as Longlac, Rankin Siding, and Mamainse Point are from roadsides and railway yards, and probably represent the progeny of stray seeds in feed grain shipped from the west. In the grain-growing areas of the Prairie Provinces, wild oat has perhaps become the most serious of all weeds because it is resistant to selective herbicides used to kill nongrass weeds (Banting 1974).

2. *Avena sativa* L.

Plate 36

cultivated oat, oats

Avena sativa, the commonest of our cereal grasses, is cultivated wherever farming is carried on in the province, particularly for livestock feed and for milling. Numerous cultivars have been developed, several especially for Ontario conditions (cf. Welsh et al. 1953, Stanton 1955, Coffman 1961).

Cultivated oats do not persist outside of planted fields except around farmyards, granaries, railroad sidings, and dumps, where stray grains have found a suitable soil on which to germinate and flourish. Ordinarily the grains, or the young seedlings that germinate quickly from them, do not survive winter conditions, unlike those of wild oat.

The occurrence of plants that are in some respects intermediate between *A. sativa* and *A. fatua* has prompted the suggestion (e.g., by Mal'tsev 1930) that the two be treated as a single species. Some of these intermediates are interpretable as F_1 hybrids (Baum 1969*a*), but others, known as "fatuoids," appear spontaneously in fields of planted oats and apart from possessing the "wild syndrome" of *A. fatua*, resemble the particular cultivar in which they occur (cf. Baum 1969*b*).

Avena sterilis **L.**—This species, which is sometimes called animated oat, is similar to *A. fatua* but has much longer awns and is sometimes cultivated in gardens as a curiosity because of the reaction of its twisted awns to changes in moisture. Specimens are known from Ottawa and Guelph, but the species does not persist as a weed.

34. Helictotrichon Besser ex Schultes & Schultes fil.

Tufted perennial grasses. Leaf blades folded along midrib, hairless; sheaths hairy; ligule long, membranous. Panicles rather slender. Spikelets purplish or bronze, usually 3-flowered; lemma with slender bent awn from middle of back; rachilla long-hairy.

The genus is distinguished from *Avena*, with which it is sometimes combined, by its perennial habit. Others subdivide the group still further, including the Canadian species in a separate genus *Avenochloa* Holub.

1. *Helictotrichon pubescens* (Hudson) Pilger (*Avena pubescens* Hudson)

hairy oat grass

A plant of *Helictotrichon pubescens*, a common European grass, appeared on the campus of the University of Western Ontario at London in 1962, but did not persist. The species only occurs in Canada as a rare introduction, although *H. hookeri* (Scribner ex Hackel) Henrard, a native western Canadian species, was originally treated as a variety of *H. pubescens*.

35. Arrhenatherum Beauv.

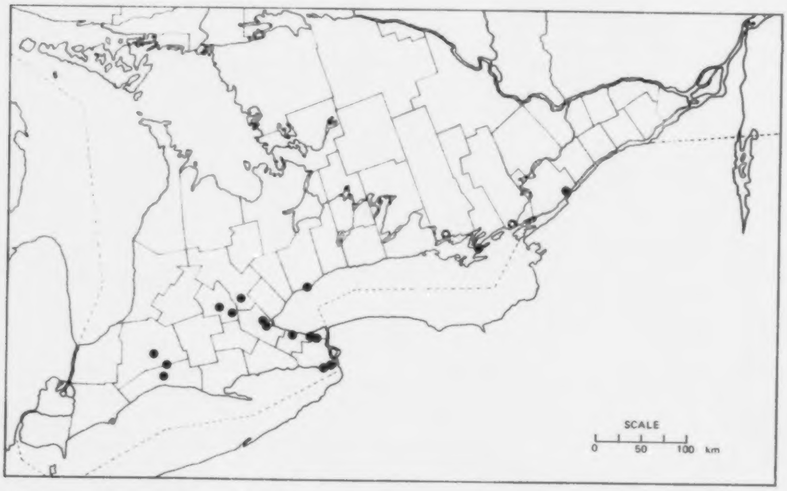
Tall perennials. Leaves hairless; ligule long, membranous. Panicle slender, open. Spikelets 2-flowered; the lower floret with stamens only; the upper floret with both stamens and pistil. Glumes membranous, scabrous; the upper glume longer than the lower one and about equal to the spikelet in length. Lemma of lower floret stiffly hairy on the callus, awned from near the base with a long, twisted, geniculate, exerted awn; lemma of upper floret hairy on the callus and lower part of back, awnless. Grain pubescent.

1. *Arrhenatherum elatius* (L.) Beauv. ex J. & C. Presl

Fig. 16, Plate 37, Map 127

tall oat grass

Formerly a much-planted hay grass, *Arrhenatherum elatius* did not persist well except in the counties along Lake Ontario and Lake Erie. Plants escaping to roadsides tend to expand into large clumps and become conspicuous because of their early flowering and silvery persistent glumes. Patches



Map 127. *Arrhenatherum elatius.*

like this have been reported from Brockville, Kingston, and Belleville, and across the southern counties to St. Thomas and London where the species was collected in 1880, the earliest record for the province.

In northern Ontario it was found at Kapuskasing in 1953 on a roadside at the Experimental Farm. At Ottawa it is known to be a high-yielding grass, but because it is even less hardy than orchard grass, it fails to survive.

A selection with variegated leaves is sometimes grown in gardens, where it is known as "ribbon grass" (*A. elatius* cv. Bulbosum Variegatum). It is propagated by corms.

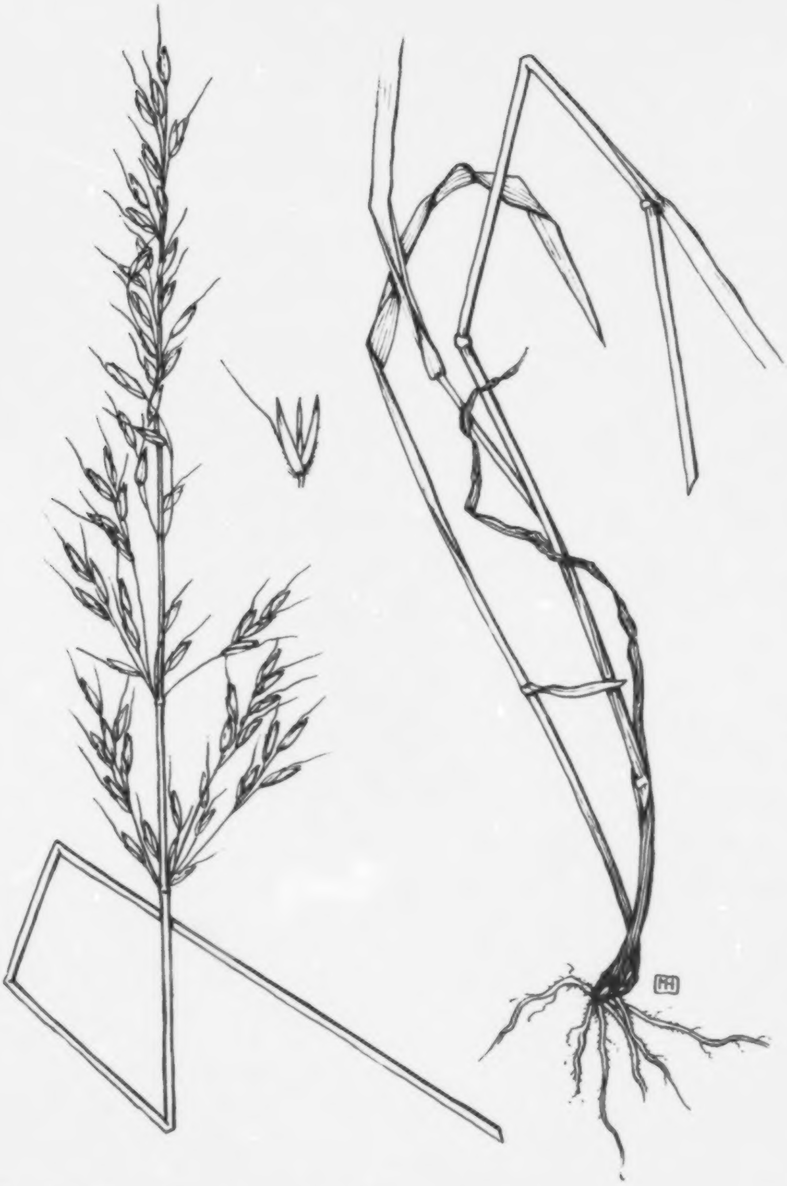


Fig. 16. *Arrhenatherum elatius* (L.) Beauv. ex J. & C. Presl

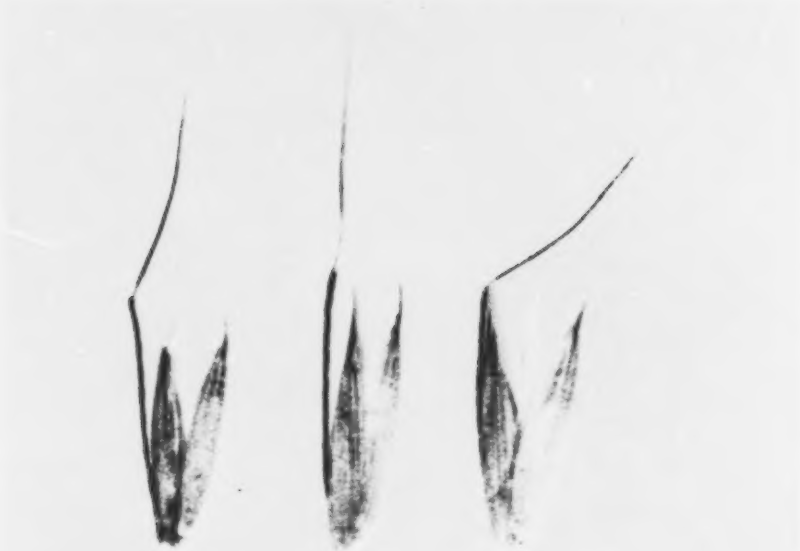


Plate 37. Floret pairs of ***Arrhenatherum elatius*** (Stroud 373).

36. Holcus L.

Velvety pubescent, tufted perennials. Foliage soft-pubescent; ligule membranous. Panicle dense. Spikelets pale-colored or pink, disarticulating below the glumes at maturity, 2-flowered, the lower floret perfect, the upper staminate. Glumes broad, enclosing the florets, densely pubescent. Lemmas firm, smooth, with a few hairs from the callus; the lemma of the lower floret awnless; the lemma of the upper floret with a hard, hooked, sharp awn not exceeding the glumes.

1. *Holcus lanatus* L.

velvet grass, Yorkshire fog

Holcus lanatus is well established in the milder parts of coastal provinces such as Nova Scotia and British Columbia, but exists only as scattered temporary introductions at inland points in southern Quebec and Ontario.

The species is of little forage value and apparently does not persist for long in Ontario. All known specimens are from intentional seedings or cultivated plots, for example at London, Toronto, and Guelph.

37. Danthonia Lam. & DC.

Tufted perennial grasses, lacking rhizomes. Leaf blades rounded on back, distinctly ridged, often pilose at least on upper surface; sheaths generally pilose-pubescent, always with tufts of a few conspicuous hairs at collar; ligule a row of hairs. Culms fracturing at the lower nodes at maturity and bearing sessile 1-spikeleted cleistogamous inflorescences inside sheaths. Panicles few-spikeleted, compact or spreading. Spikelets 5- to 10-flowered. Glumes equal in length and exceeding the florets, persistent on the pedicels. Lemmas firm, rounded, sparsely pilose with flexuous hairs on the back; apex slenderly 2-toothed with an awn, twisted at its flattened base, arising between the teeth. Callus with short, straight hairs from the sides.

Panicle branches erect and appressed, rarely spreading at anthesis; lemma teeth about 1 mm long; basal blades usually less than 10 cm long, often pilose; marcescent blades usually curled; ligule of very short hairs (about 0.3 mm) in the middle and longer ones (2–3 mm) at the margin; very common .... 1. ***D. spicata***

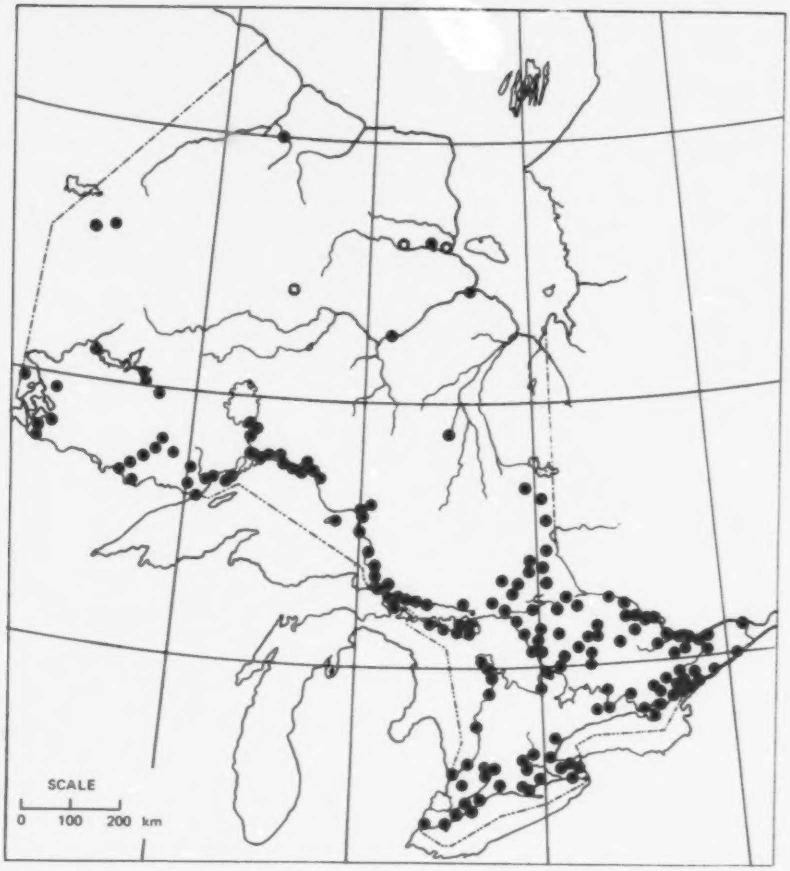
Panicle branches horizontally spreading; lemma teeth 2–3 mm long; basal blades usually 20 cm long, hairless; marcescent blades straight; ligule a uniform row of short (0.3 mm) and long (2–3 mm) hairs; rare (localized stations in the Ottawa Valley and the Niagara Peninsula) .... 2. ***D. compressa***

1. *Danthonia spicata* (L.) Beauv. (*D. allenii* Austin)

Plate 38, Map 128

danthonia, poverty oat grass

A densely tufted and shallowly rooted perennial of open habitats, *Danthonia spicata* is generally widespread in Canada, where it is found in rocky places and old fields. In eastern Ontario it has become abundant in "run-out" pastureland, along sandy roadsides, and in abandoned fields. Around rock outcrops, probably its original habitat, it is often the only grass to be found growing among blueberries and mosses. It is less abundant in southwestern Ontario, and the numerous specimens from this area indicated on the map represent rare occurrences that have attracted collectors. There is a lack of records from a large area extending northward from Lake Ontario toward Georgian Bay and westward to Lake Huron, but it is abundant in the Lake Superior area.



Map 128. *Danthonia spicata.*

Danthonia is unpalatable to livestock even when it is green, undoubtedly because the plants pull up so easily by their roots. When it is ripe, stems may be so thick in old fields that they give a whitish appearance in July, and when the stems are cut for hay any nutritional value would seem to be confined to the abundant grains. Ripe grains can survive ingestion by cattle and some may be effectively disseminated in the manure. This is one reason why *D. spicata* is one of the few native grasses that has become more successful under present land management than it seems to have been previously; most other native species have declined under agriculture.

Considerable variation is exhibited in habit of growth, degree of pubescence, curling of leaves, and the size and pubescence of spikelet parts.

The treatment by Fernald (1943*a*, 1950) is difficult to apply because it does not seem to take into account variation caused by environmental influences or the particular breeding system found in the group.

In most plants asexually formed grains are produced both in the basal leaf sheaths (cleistogenes) and in much greater numbers in the paniculate inflorescences. In these plants, abortive, nonfunctional anthers, about 0.2 mm in diameter are present inside the florets; these often adhere to the meager stigmas. The caryopsis enlarges early and soon fills the interior of the floret, its size and shape varying with its position within the spikelet and on whether the spikelet is in the panicle or in the sheath. It would seem that every floret produces a viable caryopsis in these plants, which is not the case in the less common sexual chasmogamous plants. It has been thought that the basal cleistogenes germinate *in situ*, but definite examples of this process have not been seen. It is more likely that germination of cleistogenes does not take place until after the clumps disintegrate and the sheaths rot.

Enlargement of clumps, judged from the length of old stem remnants, proceeds at the slow rate of a centimetre or two each year, and is the result of vegetative tillering of the offshoots from the basal nodes. No true stolons or rhizomes are present. The apomictically produced grains give rise to the large uniform patches found in nature; these are particularly obvious in some abandoned fields.

Not all individuals are apomictic, however. Throughout the range, at least from observations in Ontario, odd plants are encountered that produce large viable anthers that are exposed when the flowers open (about 10 a.m.) by the action of well-developed lodicules. Plants like these also have fleshy pulvini at the base of the panicle branches that cause them to diverge at the same time. These pulvini are small, but usually visible and orange in color. Morphologically, these macrantherous plants provide a striking contrast to the commoner apomictic plants that lack functional anthers, lodicules, and pulvini. The apomictic and sexual characteristics are maintained in clonal cultivation. In the fertile plants, the anthers are 1.5–2.2 mm in length, whereas in agamospermic plants they are 0.20–0.25 mm long. No intermediate lengths and no plants with a mixture of anther types have been seen.

The bulk of Ontario specimens agree with the description of typical plants (var. *spicata*) in their sparsely villous blades and sheaths. Some plants, however, have essentially hairless foliage, except for the collar tufts that are always present. Others are conspicuous by the pronounced pubescence on their blades and sheaths. The pubescence characters are maintained when the clones are transplanted to uniform plots under cultivation. These variants occur sporadically throughout the range of the species, but because of their reproductive system, are often found in large uniform patches.

Environmental conditions strongly affect the growth of the species. Disturbed or cultivated soils produce large clumps of plants with sturdy stems. In moist, shady sites single-stemmed plants may grow as high as 70 cm, but on dry baked clay soils they are often less than 20 cm high. It is possible that these starved plants are the basis of var. *pinetorum* Piper. Certainly many specimens identified as such in herbaria are of this type. Fernald describes this variety as having glumes tapering from near the middle with obscure lateral veins overlapping between one-quarter and one-half way up their length, thus covering all but the tips of the florets. Numerous specimens from the Bruce Peninsula, the northern shore of Lake Huron, and over to Lake Nipigon appear to agree with the description of this variety. When one of these specimens from Lake Nipigon was propagated by seed at Ottawa, it produced normal plants of var. *spicata*. Recognition of the variety does not seem to be useful.

A specimen from Spottiswood Lake, Waterloo Regional Municipality, has distinctive filiform-involute blades of the type characteristic of var. *longipila* Scribner & Merr. It was growing with typical plants. Slender blades are also produced in plants that grow in deep shade.

Most specimens of *D. spicata* have a sparse pilosity over the back of the lemma, as well as longer denser hairs on the sides of the lemma and on the callus. A few Ontario specimens have no hairs on the back of the lemma, a characteristic of the closely related *D. intermedia* Vasey. Plants from Great Cloche Island, Michipicoten, Albany River, and Carp (Ottawa-Carleton Regional Municipality) are of this type. The latter two specimens also have purplish lemmas at maturity, another common feature of *D. intermedia*. The dark color is also found on typically hairy lemmas in other specimens.

Some Ontario specimens have been identified as *D. allenii* Austin following Fernald's (1950) treatment in Gray's *Manual*. This taxon is said to represent coarse plants 30–100 cm high with culms more than 1.5 mm thick at the base, and with more numerous (9–20) and larger spikelets (11–25 mm long). Fernald (1953*a*) cites it from Cloche Peninsula, Manitoulin, and Pancake Bay, Algoma District. Ontario specimens that would fit *D. allenii* have been collected at several localities in northern Ontario. These were all either late-season collections (ordinarily the grass starts caryopsis development in early June), or were growing on disturbed soil. An experiment with seedlings from typical *D. spicata* showed that if these were started in a greenhouse and then placed outside, they would grow into "*allenii*" plants. Second-growth stems after cutting in plots behaved similarly.

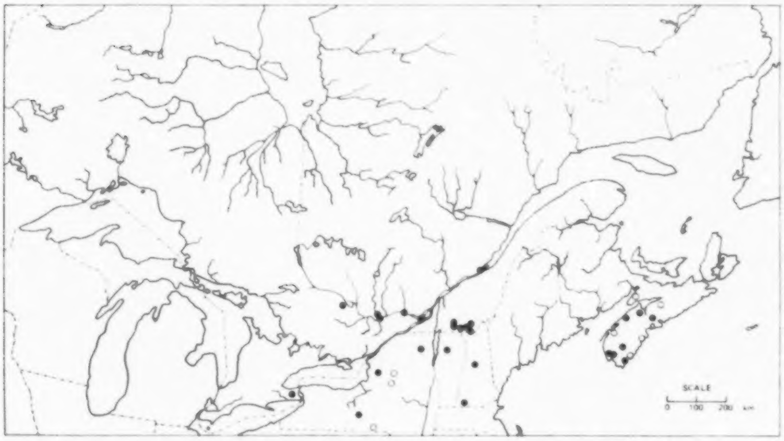
Recent studies on the taxonomy of the genus as it occurs in Canada (Baum and Findlay 1973, Findlay and Baum 1974) propose a major recasting of species limits. This is derived from an initial classification on the basis of a single character, lodicule type, and cuts across all previous treatments of the group. All five species said by Baum and Findlay to exist in Canada are reported by them from Ontario. Two comprise cleistogamous agamospermic plants and three are chasmogamous sexual ones; these in part represent different morphs of a genetic polymorphism.

2. *Danthonia compressa* Austin

Plate 38, Map 129

flat-stemmed danthonia

Danthonia compressa has been found at three localities in Ontario, Balls Falls Conservation Area, Niagara Regional Municipality, at the top of the portage from Vanishing Pond, Algonquin Park and Halfmile Rapids on the Petawawa River about 15 km above the mouth of the Ottawa River. The last of these sites represents the first portage point up the river from the Ottawa and the large stand of the grass in an opening there among tall pines could mark the location of a long-decayed riverbank shanty in lumbering days. It is tempting to speculate that some seeds sprouted from a hay-filled mattress discarded by a lumberjack from Vermont at this very point. The other locations of *D. compressa* are scattered along the Ottawa Valley, all on the Quebec side, and would also fit such a mode of introduction. Southernmost Quebec is probably the northern limit of its natural range, but the grass is an abundant weed in northern Vermont, New Hampshire, and Connecticut. Of several specimens examined, all had abortive anthers.



Map 129. *Danthonia compressa*. Known distribution in eastern Canada and representative records from the adjacent United States.

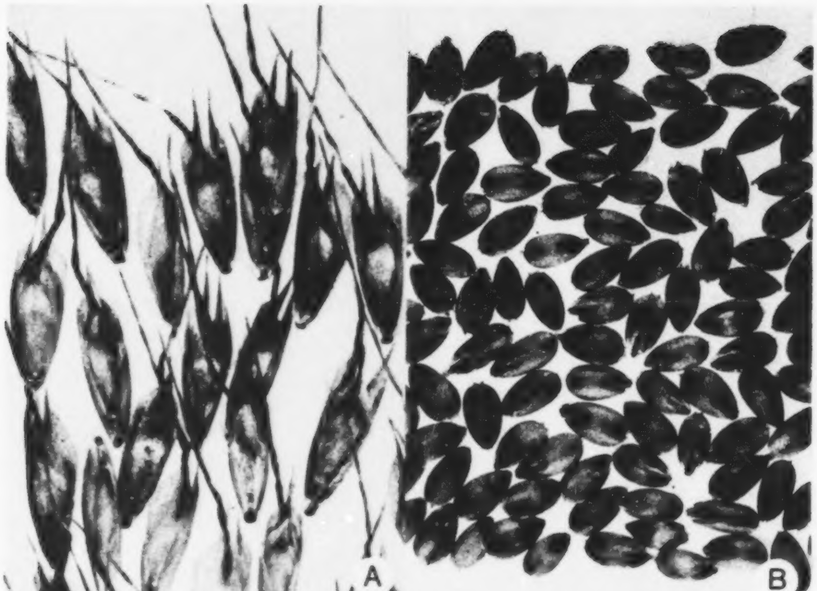


Plate 38. *A*, Caryopses of *Danthonia spicata* (Dore 21464); *B*, Florets of *D. spicata* (Dore 21464); *C*, Caryopses of *D. compressa* (Dore 18665); *D*, Florets of *D. compressa* (Dore 18665); *E*, Caryopses of *Calamagrostis canadensis* (Dore 21841).

38. Calamagrostis Adanson

Medium to tall perennial grasses, spreading extensively by rhizomes. Foliage smooth or scabrous, hairless; ligule long, membranous, scabrous on the back. Panicle large, many-spikeleted. Spikelets 1-flowered, the rachilla prolonged beyond floret and bearing fine hairs. Glumes equal in length, equaling or longer than lemma. Lemma with slender hairs arising from the callus, sometimes in lateral tufts, awned from the midrib well below the apex.

Although the North American species of the genus have been the subject of a series of complete or partial revisions (Kearney 1898, Inman 1926, Stebbins 1930, Louis-Marie 1944), their taxonomy is still unsatisfactory in many respects. Particularly uncertain is the identity of some collections from the James Bay area and of some members of the *C. inexpansa* – *C. stricta* complex in southern Ontario. Several species possess agamospermic strains (Nygren 1954). It has not been possible to interpret all the early records for the province, reported under a diversity of names.

A. Callus hairs twice as long as the lemma; rachilla obsolete, less than 0.1 mm long; lemma half as long as glumes; glumes linear-lanceolate, attenuate, 5–8 mm long; awn almost indistinguishable from callus hairs, straight, shorter than glumes; introduced species .... 5. ***C. epigejos***

A. Callus hairs shorter than to as long as the lemma; rachilla distinct, more than 0.5 mm long; lemma almost as long to as long as glumes; glumes lanceolate to ovate, acute; native species

  B. Awn longer than glumes, spirally coiled in the lower half; glumes 5–8 mm long; callus hairs very short but rachilla long and bearded .... 4. ***C. purpurascens***

  B. Awn shorter than glumes, not coiled but sometimes curved; glumes less than 5 mm long

    C. Callus hairs as long as the lemma; awn scarcely discernable among the hairs, straight; ligule thin, long-acute; panicle usually lax and open .... 1. ***C. canadensis***

    C. Callus hairs shorter than the lemma; awn much coarser than the hairs, straight or curved; ligule firm, truncate; panicle generally dense and contracted

      D. Callus hairs sparse, less than one-quarter the length of the lemma; leaf blades soft, flat, 5–6 mm wide .... ***C. pickeringii*** (p. 279)

      D. Callus hairs prominent, one-half to three-quarters the length of the lemma; leaf blades usually firm, involute, 2–4 mm wide

E. Leaf blades hard, harshly scabrous; ligule 3–6 mm long; panicle coarse, generally pale green or purplish; glumes firm, scabrous .... 2. ***C. inexpansa***

E. Leaf blades rather firm, but not hard, almost smooth; ligule 1–3 mm long; panicle softer, more slender, dark purple or brown; glumes hyaline, smooth .... 3. ***C. stricta***

1. *Calamagrostis canadensis* (Michaux) Nutt.

Plate 38, Map 130

Canada blue joint

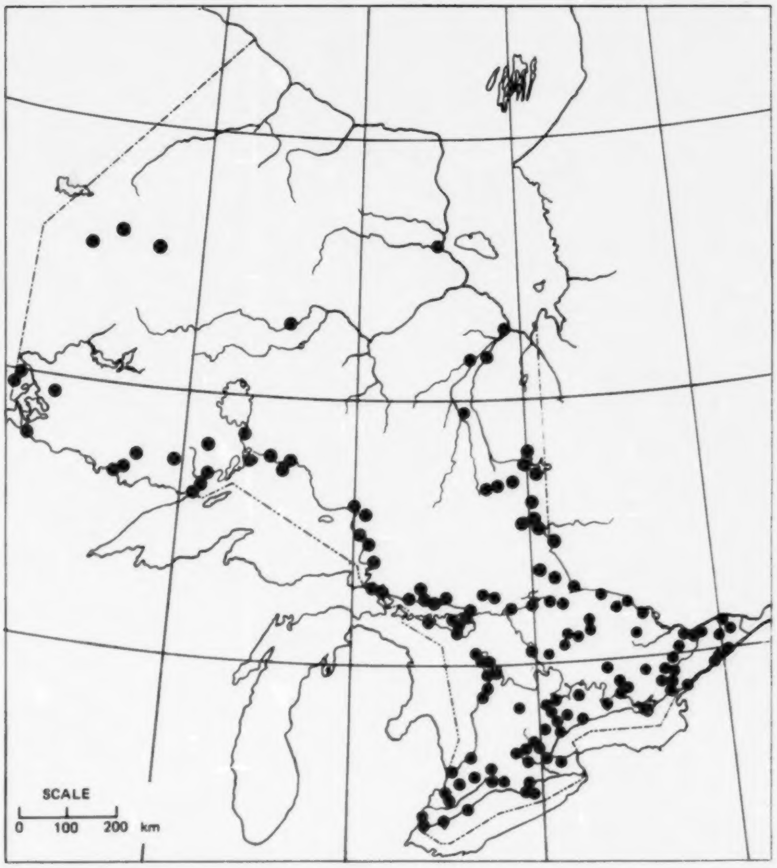
A common species throughout the province except in the extreme north, *Calamagrostis canadensis* is especially abundant in the boreal forest. In southern Ontario extensive stands are found in swamps, bogs, ditches, and shorelines. In the northern half of the province, however, Canada blue joint grows in well drained soils, rock outcrops, and sandy tracts, and shows little habitat preference.

In shaded sites, as in bottomland thickets of alder, the plants are lanky, growing often to a height of 2 m and bearing large pale-colored or greenish panicles. In open sunny sites the plants are usually shorter, up to about 1 m, and have the typical brownish purple panicles.

Besides differences due to habitat, great variability is exhibited in the size and shape of the panicle, the size, color, and scabridity of the spikelets, the time of flowering, and the comparative extent of vegetative and reproductive growth. These inherited features vary from patch to patch in a given locality, and in sites such as graded roadsides where the clones are young and vigorously expanding, they can be visibly striking. New or reconstructed highways across northern Ontario rapidly become bordered by blue joint variants, producing an extensive mosaic best seen in August.

Most stands from Algoma and Cochrane districts southward to the Ottawa Valley and eastward into Quebec are composed of plants with spikelets 2.8–3.8 mm long and minutely scabrous on the glumes. These are referred by Stebbins (1930) to the typical variety of the species (var. *canadensis*). Plants of this type from Sharbot Lake, Frontenac County, and Turkey Point, Haldimand-Norfolk Regional Municipality, were found to have a somatic chromosome number of $2n = 56$ (Bowden 1960*b*).

A few specimens with shorter spikelets, 2.5–2.8 mm long, and denser panicles, have been collected in the southwestern part of the province from Toronto to Sarnia, and on the Bruce Peninsula. These represent one extreme of the variation in spikelet size, which is more prevalent farther to the southwest. They have been referred to as var. *macouniana* (Vasey) Stebbins.



Map 130. *Calamagrostis canadensis.*

Around the shore of Lake Superior and to the northwest another variant with somewhat larger spikelets, 3.8–4.8 mm long, is often found. In these plants the glumes are firmer, faintly 3-nerved, and distinctly strigose on the back, almost ciliate on the keel, more solidly purple or brown, and narrower and flat at maturity. The lemma is transparent with thin purple veins and with a slender purple awn that exceeds it slightly in length. These plants fall within the circumscription of var. *robusta* Vasey, as treated by Stebbins (1930). However, many reports of var. *robusta*, e.g., from the Bruce Peninsula by Krotkov (1940), are based on plants that differ from the typical var. *canadensis* only in having longer spikelets.

The citations under *C. langsdorfii* and *C. canadensis* var. *acuminata* for Thunder Bay and Severn River given by Kearney (1898) seem to refer to plants of the var. *robusta* type. The variant with even larger spikelets known as var. *scabra* (C. Presl) A. S. Hitchc. (? = *C. langsdorfii* (Link) Trin.; *C. canadensis* var. *langsdorfii* (Link) Inman) does not seem to be represented in Ontario. Nygren (1954) reports a range of chromosome numbers for the *C. canadensis* complex in North America from $2n = 42$ to 66. Among these is a count of $2n = 42$ for a plant of var. *robusta* from Thunder Bay. Attempts to associate ploidy level with the taxonomy of this species complex (Löve and Löve 1965) do not seem to be satisfactory in the light of the distribution and morphology of tetraploid ($2n = 62$) and hexaploid ($2n = 56$) plants across Canada (Bowden 1960*b*).

Canada blue joint in its dense leafiness, wide adaptation, and great genetic diversity would seem to be a grass with a potential for forage exploitation; indeed, along with sedges, it often forms the bulk of the "beaver-hay" gathered from natural meadows too wet for ordinary cultivation. It grows well when transplanted to well drained arable land, but the difficulty of harvesting and sowing its light, hair-surrounded grains stands in the way of its testing and utilization as a crop species.

2. *Calamagrostis inexpansa* A. Gray

Map 131

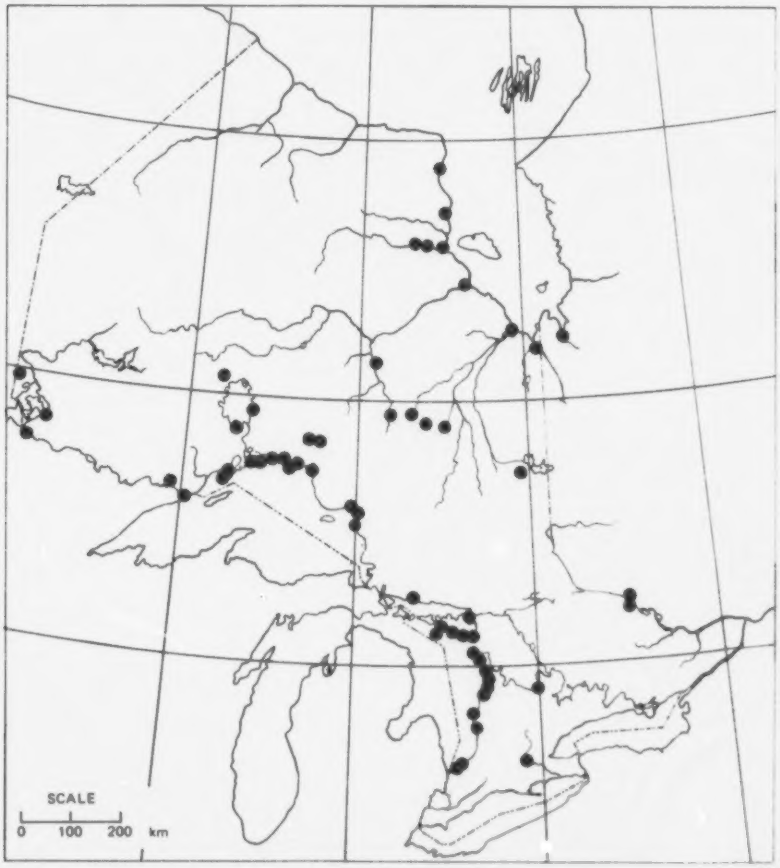
northern reed grass

Calamagrostis inexpansa is a characteristic grass of the sandy shores of Lake Huron from the Bruce–Huron county boundary to the tip of the Bruce Peninsula and Manitoulin Island. It is also common along the Lake Superior shore from Old Woman Bay near Michipicoten to the Sibley Peninsula, and at points on Lake Nipigon. It is found scattered throughout the James Bay drainage area. At Ingolf and Nestor Falls in the far west of the province, it occurs as an eastward extension of its almost continuous prairies range. Other records are very isolated such as those at Petawawa, Renfrew County, Mount Martin across the Ottawa River in Quebec, Marlbank, Hastings County, and Galt (Cambridge). The last of these stems from one collection made by Herriot at "west riverside at first island below town, June 22, 1901." This is difficult to interpret because no specimens have been found subsequently at the same place nor elsewhere in that part of Ontario.

Most specimens from Ontario would fall into var. *brevior* (Vasey) Stebbins, in which the spikelets are described as 3–4 mm long. A few specimens clustered around sites at South Sauble Beach and Dorcas Bay on the Lake Huron beaches and at the mouth of the Albany River at James Bay have larger spikelets, in the 4–5 mm range. These longer spikelets are characteristic of var. *robusta* (Vasey) Stebbins, but it is not clear that this varietal recognition is useful.

There has been confusion in the identification of plants of this species, partly because the awn is rather bent, even slightly twisted, and may protrude between the glumes (a characteristic that leads to misidentification in some keys), and partly because of the frequent modifications caused by insect infestation, such as the thickening and shortening of the floral scales and the reduction of hairs.

There are some indications that hybridization may occur between this species and *C. canadensis*; intermediate specimens are known from areas where both species occur, such as riverbanks along James Bay, the Nipigon



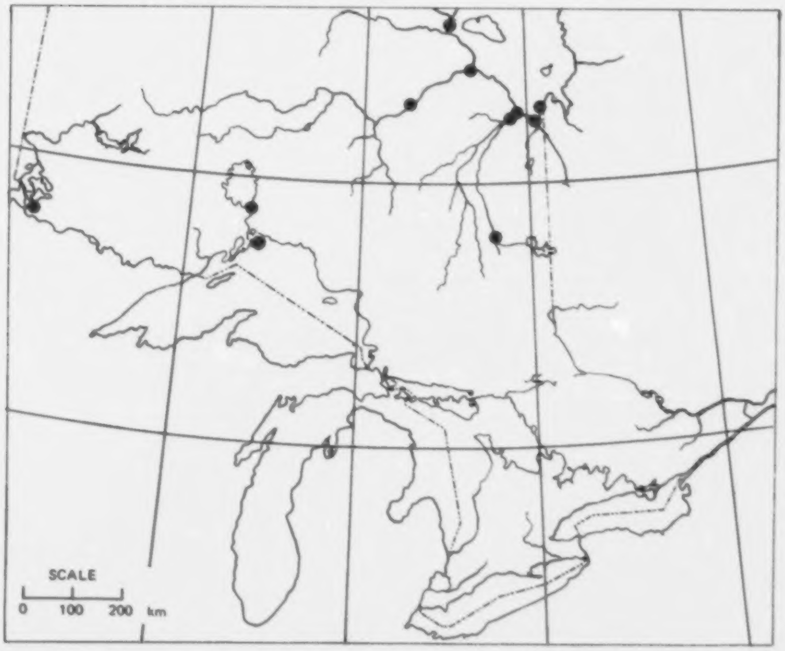
Map 131. *Calamagrostis inexpansa*. All known Canadian records from the area covered by the map are plotted.

River, and Providence Bay on Manitoulin Island. Such putative hybrids have the thinner spikelets of *C. canadensis* and the short panicle branches and coarser leaves of *C. inexpansa*; they appear to produce good caryopses.

3. *Calamagrostis stricta* (Timm) Koeler (*C. neglecta* (Ehrh.) P. Gaertner, B. Meyer, & Scherb.)

Map 132

Collections of genuine *Calamagrostis stricta* from Ontario are rare; the few known specimens are from around the shores of James Bay, at Cochrane where the species is introduced in railway yards, at Lake of the Woods, and at Nipigon River and St. Ignace Island in the northern Lake Superior area where hybridization with *C. canadensis* and *C. inexpansa* occurs, and swarms of intermediates are found. The many specimens reported as this



Map 132. *Calamagrostis stricta*. All known Canadian records from the area covered by the map are plotted.

species belong to other taxa, particularly to *C. inexpansa*, which can resemble *C. stricta* when it grows in the shade, or is sod-bound or diseased. Intermediates between *C. inexpansa* and *C. canadensis* have also been misidentified as *C. stricta*. The Waterloo County record (Montgomery 1948) is not documented but is presumably based on Herriot collections from Galt (Cambridge), which are referred to *C. inexpansa*. The specimens supporting Dodge's (1914) record from Lambton County have not been seen, but most certainly belong to some other species.

Löve (1970) and Voss (1972*a*) indicate why it is necessary to replace the name *C. neglecta* by *C. stricta*.

Calamagrostis deschampsioides **Trin.**—This boreal species, which will key to *C. stricta*, but which differs in its twisted awn and open panicle, has recently been discovered in the Hudson Bay lowlands (Riley 1979).

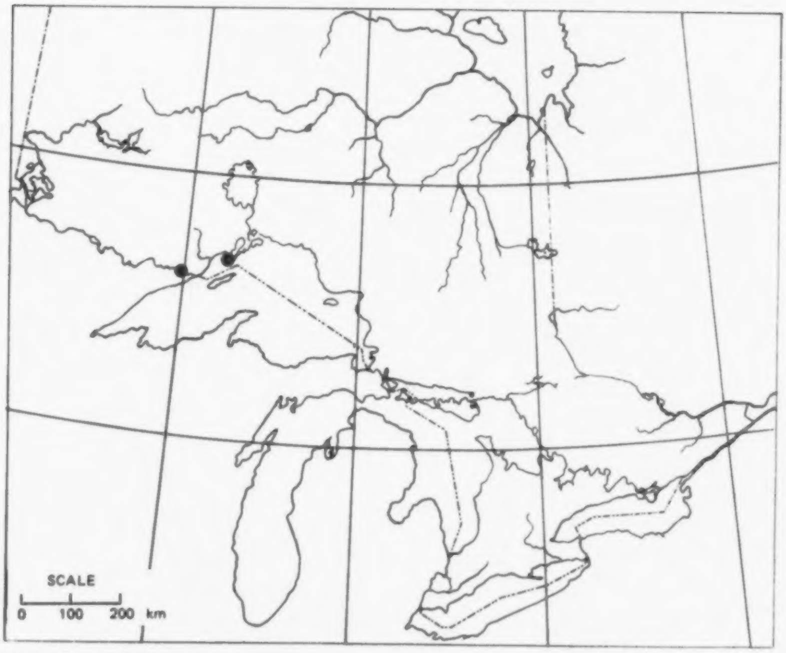
4. *Calamagrostis purpurascens* R. Br.

Map 133

A widespread cordilleran species, *Calamagrostis purpurascens* is highly localized at a few points in eastern North America. It is a distinctive, large-spikeleted, twisted-awned species, and has been collected on The Sleeping Giant of Thunder Cape in Lake Superior, either on the exposed basaltic bedrock or on its talus. It is also reported from cliffs at South Fowl Lake, another site in the Thunder Bay District, but 80 km southwestward on the Minnesota boundary (Butters and Abbe 1953, p. 124), and contiguous to others in that state.

Calamagrostis pickeringii **A. Gray**—A specimen of this species collected by P. Stewart on "rich soil, Dryden, New Ontario" (no date, but prior to 1947) is in the herbarium at the University of Guelph. The species occurs in the Maritimes and New England and is not otherwise known from Ontario. The locality data are suspect, but there is another isolated record of the species (Hitchcock and Chase 1951) from Isle Royale in Lake Superior (Michigan).

Calamagrostis lacustris **(Kearney) Nash (*C. pickeringii* var. *lacustris* (Kearney) A.S. Hitchc.)**—This species is also reported from Ontario (Flat Rock Portage, Lake Nipigon, Kearney 1898), but no authentic specimens have been seen. It is said to differ from *C. pickeringii* by its longer callus hairs in two lateral tufts, and is also characterized by its bent awn and minute rachilla.



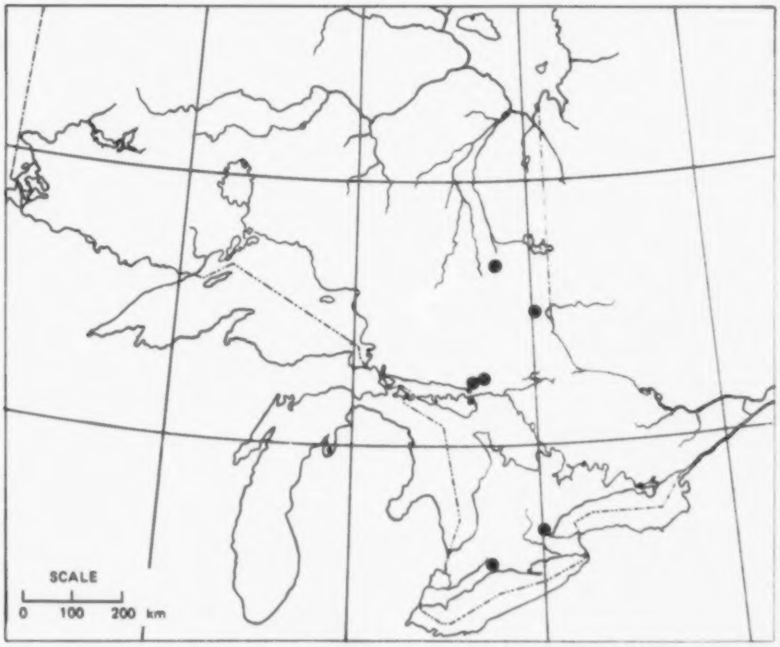
Map 133. *Calamagrostis purpurascens.*

5. *Calamagrostis epigejos* (L.) Roth

Map 134

chee reed grass, feathertop

A stand of *Calamagrostis epigejos*, an Old World grass, was first discovered in Ontario in 1948 at Flamboro Station, Regional Municipality of Hamilton-Wentworth, where it was judged to have become established a decade or two earlier. Other establishments have been detected near St. Thomas, south of Espanola, Sudbury Region, west of Nairn, Middlesex County, and north of New Liskeard, Timiskaming District. At the latter two sites the plants have sprung from impurities in the mixture used for highway seedings, and other establishments of like origin undoubtedly exist.



Map 134. *Calamagrostis epigejos.*

At South Porcupine, near Timmins, the species has been used for stabilizing tailings from the gold mines through hand planting of rhizomes purchased in Manitoba. Minor differences in the compactness of the panicle, the size of the spikelets, and the scabridity of the pedicels exhibited by the plants established in Ontario suggest three, or perhaps four, separate Old World introductions.

39. Ammophila Host

Coarse perennials with long rhizomes. Foliage coarse; blades tough, tapering to a long thin point, readily becoming involute; ligule firm-membranous, truncate, up to 5 mm long. Panicles dense, spike-like, pale-colored (pink when young). Spikelets 1-flowered, flattened laterally, more than 1 cm long. Glumes firm, scabrous, equaling the floret. Lemma thin, scabrous, with dense tuft of short straight hairs from callus, awnless or with a minute point extending from the midnerve near tip.

1. *Ammophila breviligulata* Fernald

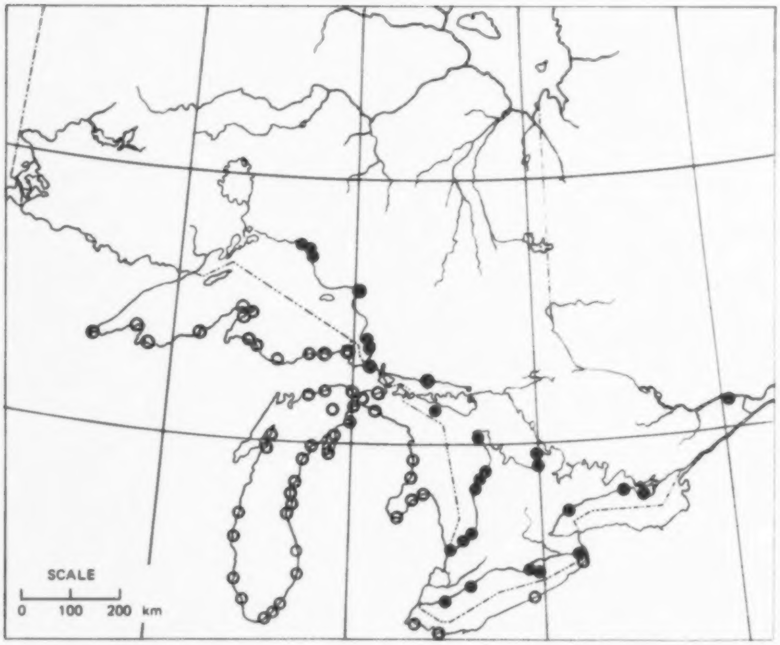
Map 135

American beach grass

A characteristic sand binder on beach dunes, *Ammophila breviligulata* occurs along the Atlantic coast as far north as Newfoundland and along the shores of the Great Lakes in the interior. In Ontario the stands, however, are somewhat localized and do not occur on all sand dunes along the lakes. It seems that the species today is not aggressively colonizing new habitats by seed. The fact that Macoun (1888) and other early collectors mention it as rare, coupled with the fact that subsequent botanists continue to re-collect it at the same places, shows that its occurrence is actually rather disjunct although this is not so apparent from the map. It is notably absent from Manitoulin and other large islands in Lake Huron and Lake Superior.

At Presqu'ile on Lake Ontario the small patch present may have been planted, as was another on a railroad bridge embankment at Hawkesbury. A Herriot specimen labeled "Galt" (Cambridge) originally came from Long Point on Lake Erie.

The short truncate ligule readily distinguishes this species from the European *A. arenaria* (L.) Link, which is not known to be introduced anywhere in Ontario. *A. breviligulata* is similar in habit and habitat to *Elymus mollis*, which is considerably coarser in its flowering and vegetative parts and has a velvety pubescence throughout its inflorescence.



Map 135. *Ammophila breviligulata*. All known records from the area covered by the map are plotted. Those records marked by an open circle (o) are taken from Guire and Voss (1963).

40. Calamovilfa (A. Gray) Hackel ex Scribner & Southworth

Coarse, perennial grasses with hard scaly rhizomes. Leaf blades glabrous, coarse, broad at base but tapering into a long thin tip, readily inrolling; sheaths with tufts of soft hairs at the margins of the collar; ligule a dense fringe of fine hairs fused together at base. Panicles large. Spikelets about 6 mm long with firm chartaceous glumes, lemma, and palea. Glumes sharply keeled, glabrous, unequal in length, the lower exceeding the lemma. Lemma awnless with a dense fringe of straight hairs arising from the callus and extending a little more than half the length of the lemma, otherwise glabrous. Palea as long as the lemma.

1. *Calamovilfa longifolia* (Hooker) Scribner

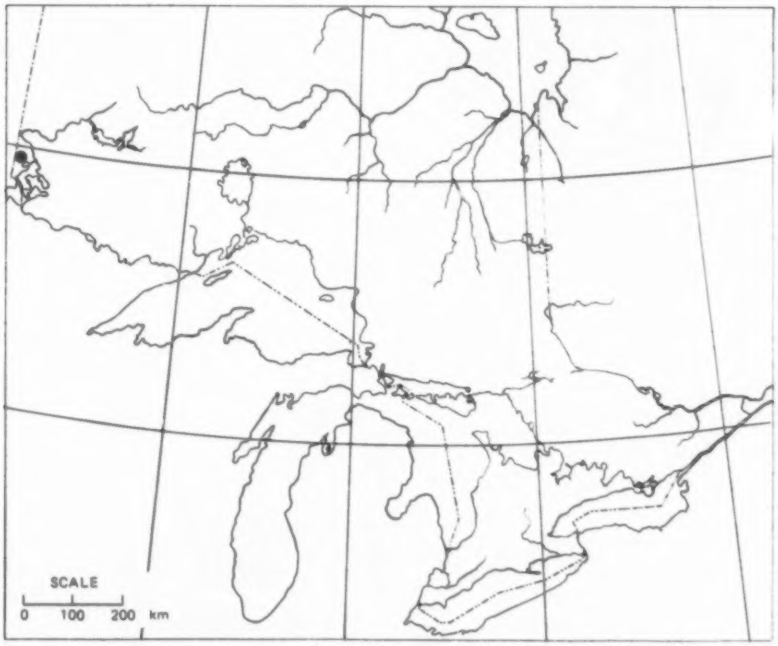
Plate 39, Maps 136 and 137

Panicle contracted, the branches closely appressed at their base to the axis; leaf sheaths glabrous or the lowermost sparsely pilose; plants usually 50–100 cm high .... a. var. ***longifolia***

Panicle open after flowering, the branches widely spreading from conspicuous pulvini at their base; leaf sheaths, especially the middle and lower ones, pilose with matted hairs; plants usually 100–150 cm high .... b. var. ***magna***

1a. var. *longifolia*

Calamovilfa longifolia var. *longifolia* is a characteristic grass of the drier parts of the prairies (Thieret 1966). A single specimen collected near the Manitoba border at Ingolf by Denike represents the only Ontario record. Two marked color forms exist; one has pale yellowish green spikelets and the other has bright reddish purple ones. When growing side by side these clones offer a striking contrast indicating that the differences are a result of genetic factors. Some intermediate shades of color exist, but in the extremes, the difference in color of the spikelets is striking and extends to other parts of the plants such as the anthers and exposed portions of leaf sheaths and culms. The reddish purple color form is more abundant across the prairies and the Ontario specimen is of this type.

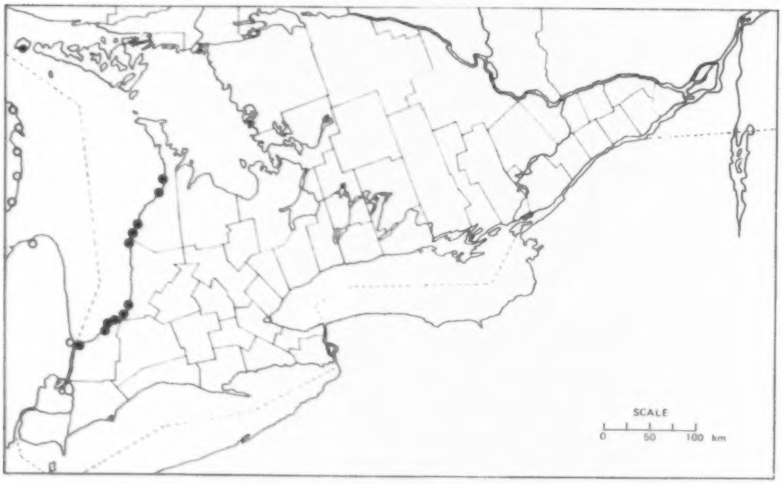


Map 136. *Calamovilfa longifolia* var. *longifolia.*

1b. var. *magna* Scribner & Merr.

Var. *magna* is restricted in Canada to the shore of Lake Huron, where it grows, often abundantly, in the sand dunes from Point Edward in Lambton County to Sauble Beach in Bruce County, then at Cockburn Island, Manitoulin District. Dodge (1914) lists it "on the upper beach at Point Pelee but not abundant." Since Core (1948) does not record it from any of the Erie Islands and no specimen is available, occurrence on the shores of Lake Erie is doubtful. The occurrence of *C. longifolia* in Ontario was not known until 10 years after the publication of John Macoun's *Catalogue*. James M. Macoun (1898) recorded its presence on the basis of collections by Dearness, which are referable to var. *magna*.

Along the north shore of Lake Michigan, var. *magna* also shows two distinctive color forms, one purplish in the panicle and the other pale yellowish green. Both grow together in clonal patches at certain places on the exposed sand dunes, but the purplish form appears to be the commoner



Map 137. *Calamovilfa longifolia* var. *magna*. All known records from the area covered by the map are plotted.

one in general. This is also the prevalent color type along the Ontario shores of the Great Lakes, where only one pale-colored specimen is known. This was collected with the purplish-colored variant at Point Edward.

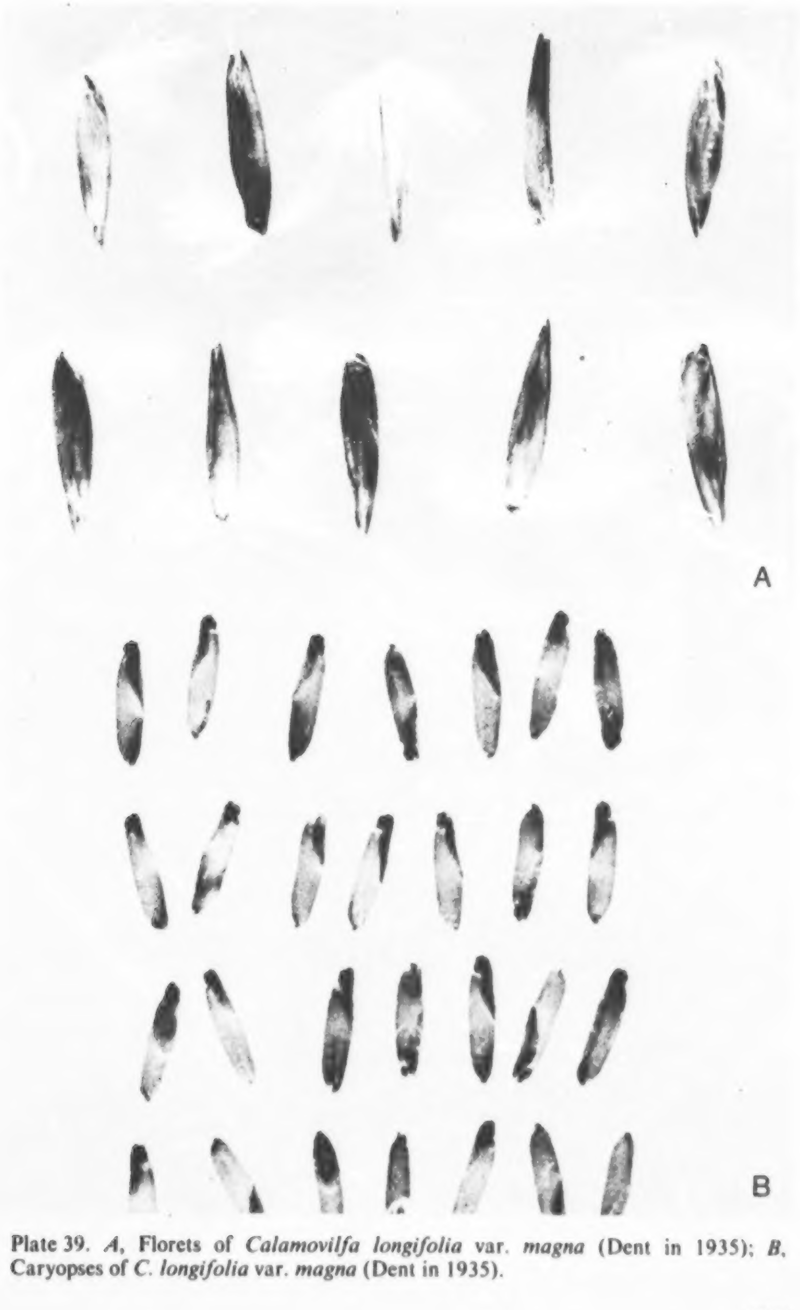


Plate 39. *A*, Florets of *Calamovilfa longifolia* var. *magna* (Dent in 1935); *B*, Caryopses of *C. longifolia* var. *magna* (Dent in 1935).

41. Agrostis L.

Medium-sized perennials (rarely annuals), spreading by rhizomes or stolons or closely tufted. Foliage hairless, scabrous; ligule membranous. Panicle rather delicate with many small, 1-flowered spikelets. Glumes almost equal, generally scabrous on the keel, smooth elsewhere, longer than the floret. Lemma thin, membranous, generally with a few microscopic hairs at the callus, awnless or awned from back in a few species. Palea very thin, shorter than the lemma or obsolete.

- A. Plants annual; panicle at least half the plant height; pedicels more than 8 mm long; spikelets 1–1.5 mm long; cultivated for dry bouquets ***A. nebulosa*** (p. 298)
- A. Plants perennial; panicle less than half the plant height; pedicels less than 6 mm long; spikelets 1.5–3.5 mm long; native or naturalized
  - B. Palea about one-half length of lemma; anthers 1–1.3 mm long
    - C. Ligule on lower leaves, 0.5 mm long, wider than long, truncate, firm, transparent, brownish toward base; spikelets mainly toward the outside of the panicle on divaricately spreading branchlets; rhizomes short, fine .... 3. ***A. capillaris***
    - C. Ligule on lower leaves, 2–4 mm long, longer than wide, rounded or acute and becoming frayed at the tip, thin, membranous, generally whitish; spikelets on appressed or ascending branchlets, many on short branches near the panicle axis
      - D. Underground rhizomes present; leafy stolons sometimes absent; panicle open during and after anthesis, pyramidal or oblong; leaf blades usually more than 3 mm wide .... 1. ***A. gigantea***
      - D. Underground rhizomes absent; leafy stolons present; panicle open at anthesis but closed and cylindrical thereafter; leaf blades usually less than 3 mm wide .... 2. ***A. stolonifera***
  - B. Palea one-tenth length of lemma or completely absent; anthers usually 0.2–0.8 mm long, 1 mm long in *A. canina*; ligule usually more than 1 mm long, thin, membranous
    - E. Plants tufted, without stolons; lemmas usually awnless, occasionally with awns in upper spikelets; awns sometimes straight and short; panicle branches scabrous, sometimes minutely so
      - F. Panicle branches rebranching at or above the middle; anthers 0.2–0.5 mm long; leaf blades mainly basal, generally inrolled and equally scabrous on both surfaces, usually less than 2 mm wide; flag leaf usually shorter than lowest panicle branch; flowering in July .... 4. ***A. scabra***
      - F. Panicle branches often rebranching below the middle; anthers 0.5–0.8 mm long; leaf blades distributed along the culm, generally

flat and less scabrous on the back, usually 2–4 mm wide; flag leaf usually about twice as long as lowest panicle branch; flowering from mid-August to September .... 5. ***A. perennans***

E. Plants with short, creeping, leafy stolons; lemmas awned from the back; awn bent and extending beyond the glumes; panicle branches smooth

G. Anthers about 1 mm long; introduced; fine-turf grass .... 6. ***A. canina***

G. Anthers 0.5–0.6 mm long; native; expected in far north .... 7. ***A. borealis***

1. *Agrostis gigantea* Roth (*A. alba* auct. amer., non L.; *A. nigra* auct., ? an With.; *A. stolonifera* var. *major* (Gaudin) Farwell)

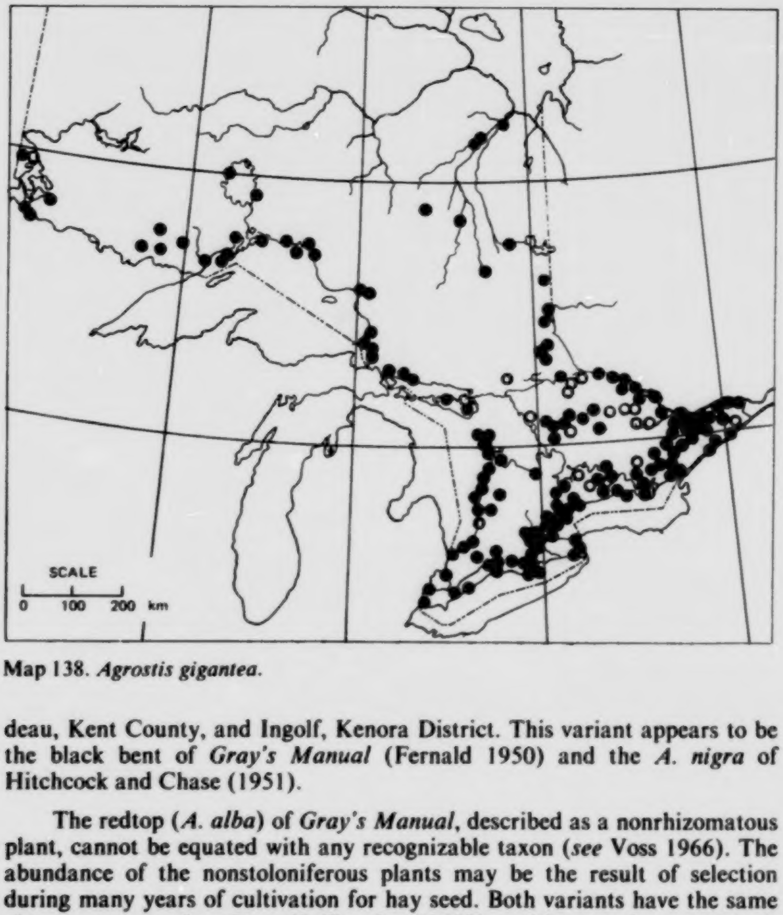
Fig. 17, Plate 40, Map 138

redtop

The specific limits of *Agrostis gigantea* are now well established as a result of the extensive morphological, cytological, and experimental studies by Philipson (1937), Jones (1956), and particularly Widén (1971). This species concept covers all the rhizomatous bent grasses that Hitchcock and Chase (1951) place in *A. alba* and *A. nigra*, and that Gleason and Cronquist (1963) regard as one variety of *A. stolonifera*. The species is clearly an introduction from Europe and there is no evidence of its native occurrence in Ontario. More than one genetic variant is involved, the most abundant and widespread being the strain known as redtop, which is extensively cultivated for hay and pasturage, and has escaped to roadsides, streambanks, and beaches or to waste places in fields on moist soil, where its decidedly red panicles, when immature, provide a distinctive patchwork of color.

In eastern Ontario, *A. gigantea* may become the dominant grass cover in old fields and pastures on poorly drained sand plains, but not on heavy or dry soils. In Bruce and Huron counties it is also abundant on most kinds of soil, but in the southwestern counties it is restricted to ditch banks and wet beaches and is much less common. However, numerous specimens have been collected because of its relative rarity. For some years redtop has been present around settlements in the north. It was collected as early as 1884 by Macoun at Nipigon House.

Following Philipson (1937), two varieties of *A. gigantea* are recognizable on the basis of the presence or absence of stolons (leafy surface runners) in addition to the rhizomes. Plants lacking leafy stolons or with erect leafy shoots from a partially decumbent base, var. *dispar* (Michaux) Philipson, are the common type throughout Ontario. Those with long, coarse, leafy stolons, var. *gigantea* (var. *ramosa* (S. F. Gray) Philipson), are represented by very few specimens from scattered localities, such as Ottawa, Collins Bay near Kingston, Cherry Valley, Prince Edward County, Ron-



Map 138. *Agrostis gigantea.*

deau, Kent County, and Ingolf, Kenora District. This variant appears to be the black bent of *Gray's Manual* (Fernald 1950) and the *A. nigra* of Hitchcock and Chase (1951).

The redtop (*A. alba*) of *Gray's Manual*, described as a nonrhizomatous plant, cannot be equated with any recognizable taxon (*see* Voss 1966). The abundance of the nonstoloniferous plants may be the result of selection during many years of cultivation for hay seed. Both variants have the same chromosome number, $2n = 42$ (Bowden 1960*b*), and intergrade morphologically.

In Malte's (1928) treatment of the group, which is essentially followed by Gleason (1952) and Gleason and Cronquist (1963), redtop (*A. gigantea*) and creeping bent grass (*A. stolonifera*) are regarded as extremes of one polymorphic species. Cytological evidence (Björkman 1954; Jones 1956), shows that the two species generally differ in ploidy level, and although hybrids between them can be readily produced experimentally, these are usually sterile and seem to be rather infrequent in nature (Widén 1971, pp. 122–125).

A specimen found in a railroad yard at Prescott represents a strange variant with glomerules of spikelets massed at the end of the drooping

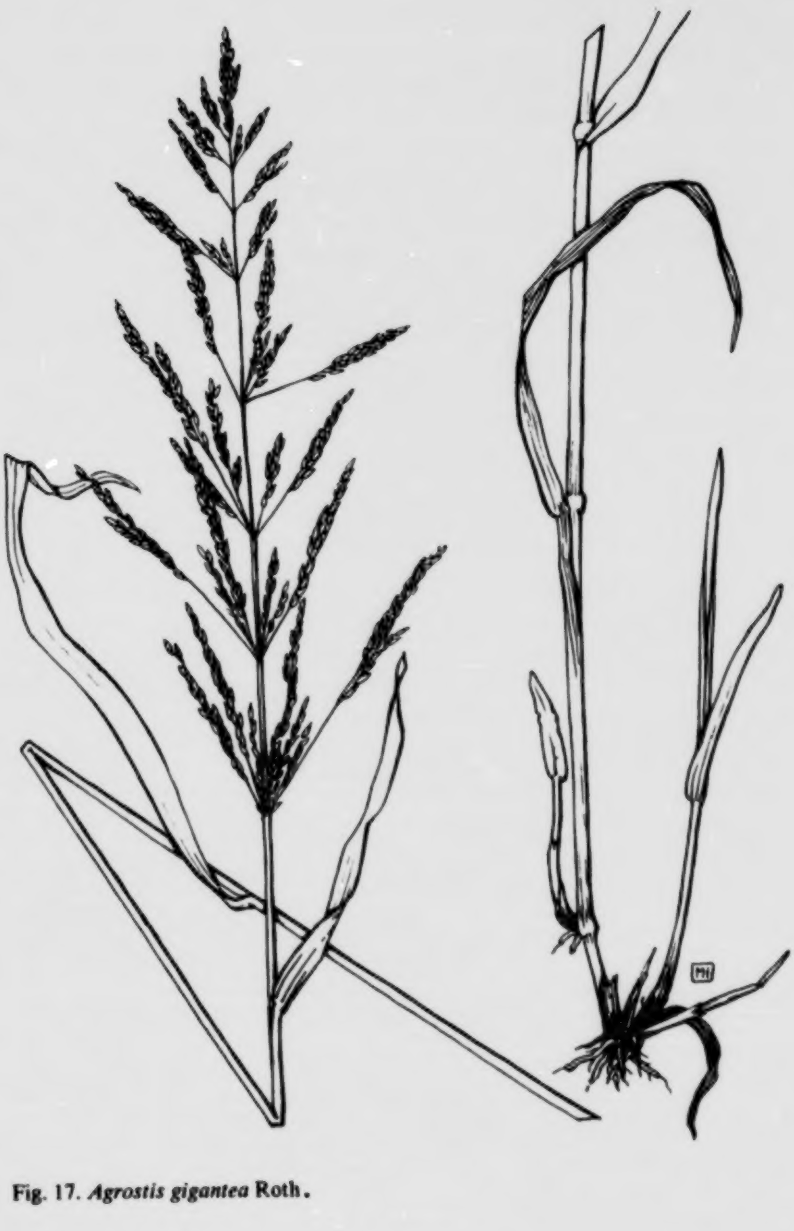


Fig. 17. *Agrostis gigantea* Roth.

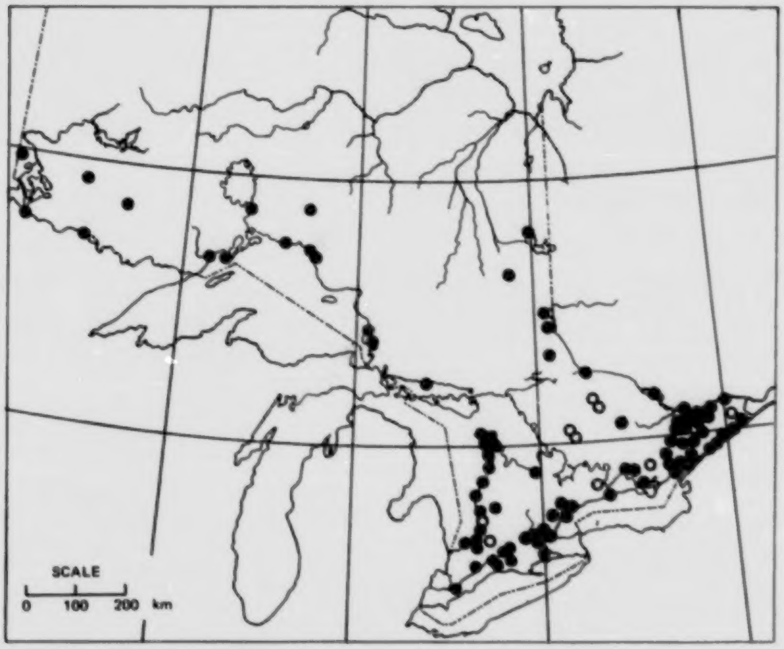
panicle branches. Plants with panicles of strikingly elongated spikelets are infected with nematodes (*Anguina* sp.). Such plants are found in moist places, usually along paths, where light treading has pressed the developing shoots into the soil without crushing them too severely. These plants exhibit clone-like groupings as though the infection is systemic.

2. *Agrostis stolonifera* L. (*A. alba* L. var. *palustris* (Hudson) Pers.; *A. palustris* Hudson)

Map 139

creeping bent grass

It is now well established that the circumscription of *Agrostis stolonifera* comprises those bent grasses without rhizomes, but with creeping leafy stolons. It is, however, a much more variable species than *A. gigantea* and although mainly tetraploid (2*n* = 28) includes pentaploid and hexaploid plants (Björkman 1954, Widén 1971). In Ontario there are obvious differ-



Map 139. *Agrostis stolonifera*.

ences in habit of growth, in color and size of foliage, and in panicle form; these differences are maintained when clones are transplanted to a nursery. In the wild state, the length and vigor of the stolons are also variable.

Plants of creeping bent grass are common throughout southern Ontario, northward to the Bruce Peninsula, the north shore of Lake Superior, and across southern Kenora District, but apparently absent from Manitoulin Island. All indications are that it is an introduction in these northern localities.

Plants from ditches, stream banks, and wet spots in pastures develop long stolons, 30–60 cm in length, and soft green blades, 5–15 cm long and about 3 mm wide. These plants are completely naturalized and have spread rapidly by vegetative and seed means and now often form continuous mats along secluded shores where they survive periodic submergence. Some plants from the sandy shores of lakes Ontario, Huron, and Superior, however, have shorter and denser stolons, smaller and stiffer blades, and numerous small, usually brown-purple panicles. These may represent a native race or an ecologically adapted variant selected from introduced plants.

Numerous strains of creeping bent grass have been promoted for fine-turf purposes, and in Ontario these perform well in moist sunny lawns.

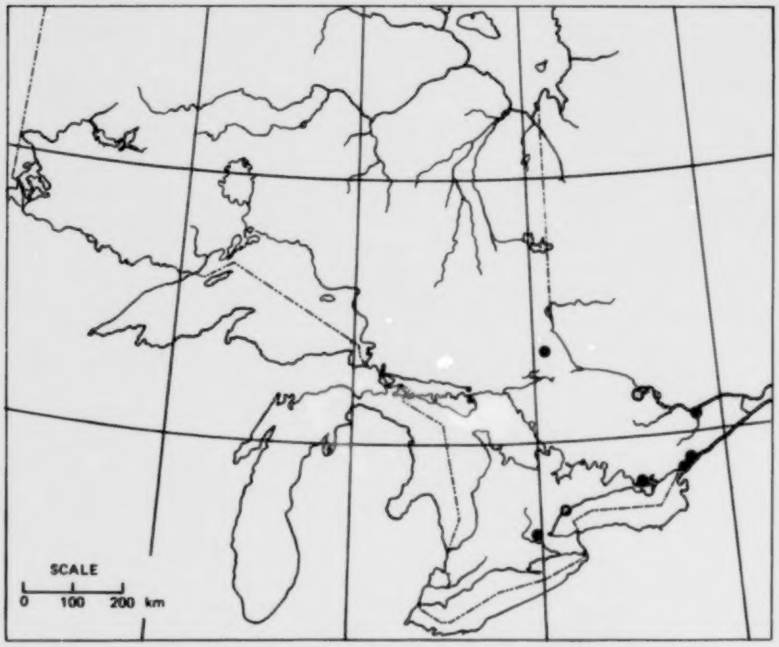
3. *Agrostis capillaris* L. (*A. tenuis* Sibth.)

Map 140

browntop, colonial bent grass

Although an excellent turf grass, *Agrostis capillaris* is not well adapted to Ontario conditions. It has been widely seeded in lawn mixtures, but has established itself to such a limited extent that few specimens exist in herbaria. In the Maritime Provinces, by contrast, this species dominates fields, lawns, and roadsides and is perhaps the most common of all grasses. Annotations on Ontario specimens indicate that *A. capillaris* requires moist, often shaded situations on acid soils. The earliest collection is from Belleville in 1874. The only record outside of cultivation is that from shaded rocky pastureland on sandstone north of Brockville.

Highland bent, usually referred to as *A. tenuis* cv. Highland (e.g., in Hanson 1972), is frequently included in commercial lawn seed mixtures. The plants grow vigorously and have coarser, deeper rhizomes than is usual in *A. capillaris* so that they may soon overwhelm a lawn. The foliage lacks the brilliant green of *A. capillaris* and is more of a gray-green color. The "seeds" may have an awn and a few scant hairs on the back of the toothed lemma, but such awned and hairy lemmas occur only in a few of the spikelets of the panicle. Plants grown from awned seeds are the same in



Map 140. *Agrostis capillaris.*

habit and behavior as plants from awnless, hairless seeds. Scholz (1965) has claimed that the cultivar is referable to the Mediterranean *A. castellana* Boiss. & Reuter, but Widén reports that cv. Highland imported into Finland is referable to *A. capillaris*. Paunero (1947, pp. 600–602) has discussed the difficulty in Spain of separating *A. castellana* from *A. capillaris* and their putative hybrids. The cultivar was originally selected in Oregon from naturalized bent grasses.

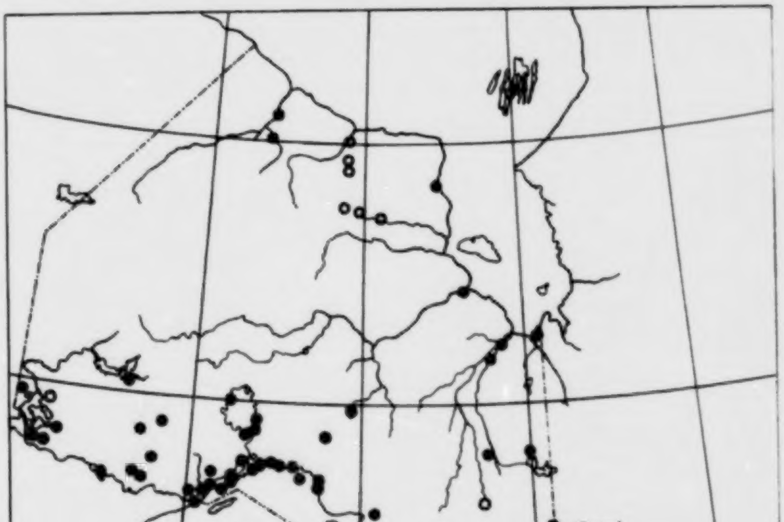
4. *Agrostis scabra* Willd. (*A. hiemalis* var. *tenuis* (Tuckerman) (Gleason)

Plate 40, Map 141

rough hair grass, tickle grass

Agrostis scabra is one of the most characteristic plants of open sites where the soil tends to become dry periodically, such as on shallow rock or recently burnt-over tracts. It often becomes so abundant as to cast a pinkish haze over the land in mid to late summer, so that the name "fire grass" is sometimes used. Roadside shoulders and railroad yards are other typical sites that the species invades from nearby habitats where it is less conspicuous. On lakeshores, bog trails, and thickets the plants are reduced in size, and if shaded do not take on their usual reddish panicle color.

Wide-ranging in Canada, *A. scabra* extends throughout Ontario. In the far north of the province, where it is the only *Agrostis* species represented, it is abundant on the drier beach ridges of James Bay and on the eroded banks of the north-flowing rivers. On the exposed rocks along Lake Superior, it seems to be present nearly everywhere, but because the conditions are poor the tufts are small and weakly rooted, and the plants are sometimes



Map 141. *Agrostis scabra.*

mistaken for annuals. In the 1960s when extensive flats were exposed along Lake Huron because of lowering water levels, this grass colonized these areas quickly and densely. In the southern counties, *A. scabra* is seen much less often, and there are large areas from which no specimens have been collected.

Plants with dorsally awned lemmas have been called f. *tuckermanii* Fernald. Two specimens from Ontario approach this form in having straight awns on a few lemmas only. These specimens came from Schreiber, Thunder Bay District, and Lake Abitibi, Cochrane District.

Plants with shorter panicle branches (usually less than 6 cm, in contrast with more than 10 cm in typical plants) have been described as var. *geminata* (Trin.) Swallen, and are concentrated in the southeastern counties. There they make a distinctive and easily recognized display by their dense tufts of erect stems on the granitic or limestone rock pavements, where few other plants grow. Usually *A. scabra* var. *scabra* and *A. perennans* inhabit distinctive habitats in the same district. These plants of var. *geminata* are intermediate in many features of morphology and habit; they also bloom at an intermediate season.

Agrostis scabra is sometimes treated as a variety of *A. hiemalis* (Walter) Britton, E. E. Sterns, & Poggenb. Typical *A. hiemalis* var. *hiemalis* is not, however, known anywhere in Canada. The differences between the two species are discussed by Björkman (1960).

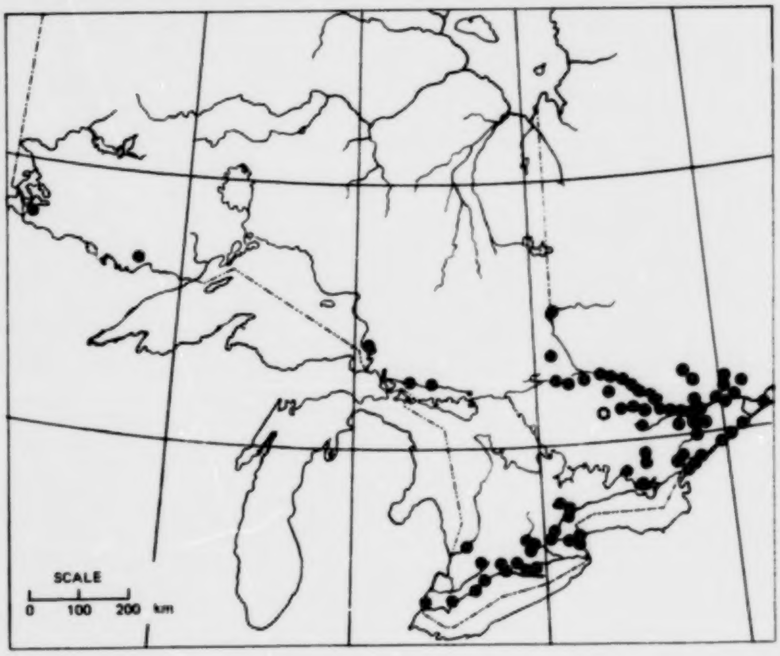
5. *Agrostis perennans* (Walter) Tuckerman

Plate 40, Map 142

autumn bent grass

Agrostis perennans is an abundant grass in shoreline thickets of the Ottawa River and the lower reaches of its tributaries as far up as the Mattawa. It also occurs on the shores of lakes Nipissing, Temagami, and Temiscaming, on small wooded islands in the St. Lawrence River, and on lakeshores in Leeds, Frontenac, and Hastings counties. Across the southwestern counties, however, *A. perennans* is scarce, and has a scattered distribution in moist woodlands. Its absence from much of the province is indicated by the lack of specimens from such well-collected areas as the Bruce Peninsula, Algonquin Park, the Manitoulin area, and the Clay Belt. Isolated sites in northern Ontario include those at the mouths of the Serpent, Mississagi, and Batchawana rivers, Algoma District, near Macdiarmid, Lake Nipigon, Thunder Bay District, and in Quetico and Lake of the Woods parks, Rainy River District.

In open and disturbed sites on flood shores, the plants are robust and erect with full panicles of purplish spikelets. In the shade they are weak and delicate, often with thin tangled panicle branches and fewer green spikelets. These plants have been called var. *aestivalis* Vasey. Other plants suffering from drought after spring flooding may resemble *A. scabra* var. *geminata* but retain the longer anthers and later-flowering habit of *A. perennans*. As in *A. scabra* an awned form, f. *chaetophora* Fernald, has been described. It is represented in Ontario by specimens from the Serpent River, Algoma District, and Lake Wistiwasing, Nipissing District. At Serpent River, it grows with the more common awnless form. Chromosome counts of $2n = 42$ were made on seedlings from plants collected at Rankin Siding on the Ottawa River and from near Kaladar, Lennox and Addington County (Björkman 1951, 1960).



Map 142. *Agrostis perennans*. All known Canadian records from the area covered by the map are plotted.

6. *Agrostis canina* L.

velvet bent grass

A soft, fine-leaved creeping grass, *Agrostis canina* is perhaps the most desirable of any species for producing superior golf greens. It is well naturalized in coastal parts of Newfoundland, Nova Scotia, and Prince

Edward Island, but in Ontario it is not known to escape and persist in untended places, and no herbarium specimens have been preserved. In dense swards, flowering stems are repressed, and in closely clipped greens all flowering parts are entirely lacking; this explains the absence of reference specimens in herbaria. Under row cultivation at Ottawa, flowering culms and seed are produced in moderate quantities. Velvet bent is advertised widely and recommended for golf and bowling greens. It is usually established by the planting of stolons, as seed is not readily obtainable.

Ideal conditions for velvet bent turfs are provided in the state of Rhode Island, and numerous cultivars have been selected there. In Ontario, difficulties in maintenance have directed popularity more to the creeping bents.

7. *Agrostis borealis* Hartman

northern bent grass

Common across the arctic and occurring on the eastern coast of Hudson Bay and throughout the interior of northern Quebec, *Agrostis borealis* has only recently been discovered in the boreal portion of Ontario (Riley 1979).

Agrostis nebulosa **Boiss. & Reuter**—This is a delicate, finely branched annual, native to the Mediterranean region and is called cloud grass. It is sometimes cultivated in gardens as an ornamental spray for dry bouquets, but it does not persist.

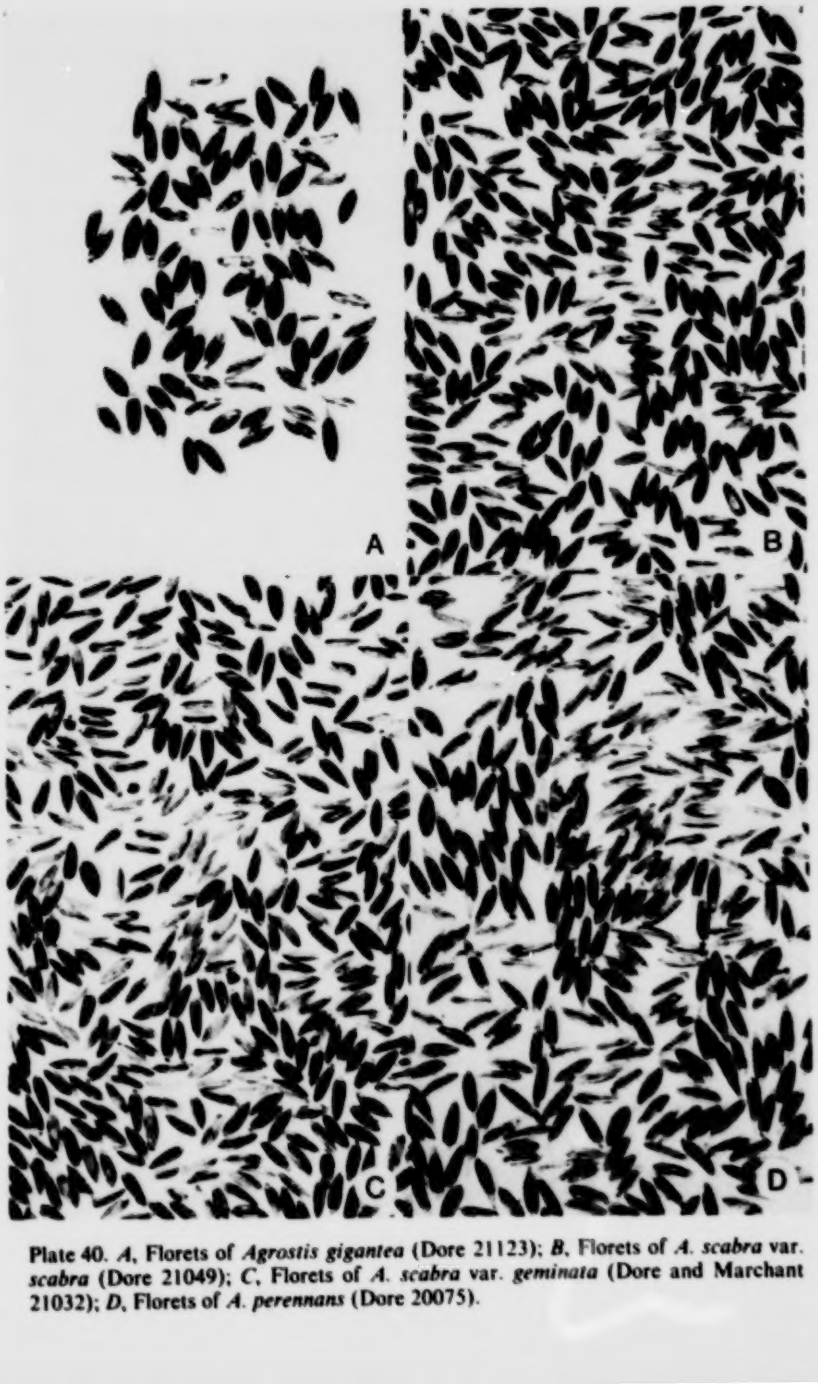


Plate 40. *A*, Florets of *Agrostis gigantea* (Dore 21123); *B*, Florets of *A. scabra* var. *scabra* (Dore 21049); *C*, Florets of *A. scabra* var. *geminata* (Dore and Marchant 21032); *D*, Florets of *A. perennans* (Dore 20075).

42. Cinna L.

Tall, slender, glabrous, tufted perennials with broad, soft leaf blades. Ligule long and membranous. Panicles large, nodding, composed of small spikelets. Spikelets 1-flowered, compressed laterally, disarticulating below the glumes; rachilla elongated beneath the floret as a short stipe and sometimes extending above the floret into a minute bristle. Glumes scabrous, hyaline-margined, almost equal in length and width, the upper as long as the lemma. Lemma scabrous, with a short (up to 1 mm long) straight awn from the back near the minutely bifid apex. Palea apparently 1-nerved (2 veins close together). Stamen 1 (a rare feature in grasses). Caryopsis with plastic endosperm.

Spikelets, exclusive of awns, 4.5–6 mm long; panicle dense, its branches rather stiff and ascending .... 1. ***C. arundinacea***

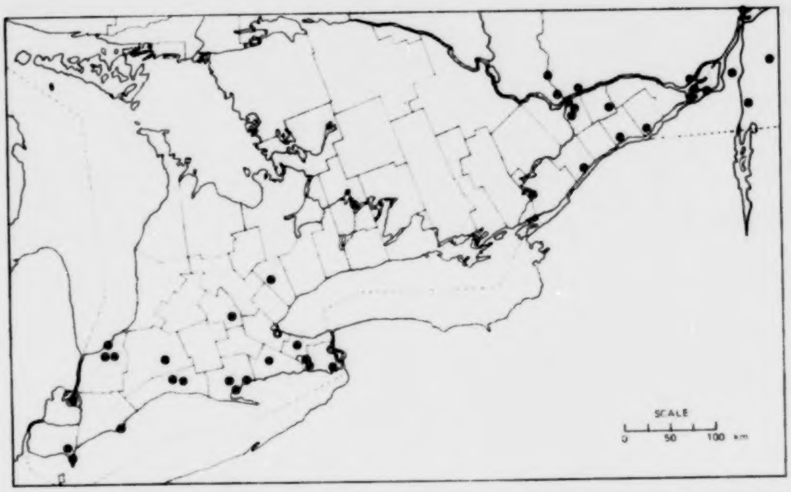
Spikelets, exclusive of awns, 2.5–4.5 mm long; panicle rather lax, its slender branches flexuous, spreading or drooping .... 2. ***C. latifolia***

1. *Cinna arundinacea* L.

Plate 41, Map 143

stout wood grass, stout woodreed

A handsome grass of moist woodland, *Cinna arundinacea* is rather scarce in Ontario and confined to the southern part of the province. It is found scattered in the eastern counties and in adjacent Quebec, at Fenelon Falls in Victoria County, and from Peel to Lambton counties southward. Records from Belleville (Macoun 1888) and Wellington County (Stroud 1941) are erroneous, being based on *C. latifolia*. A listing for the Toronto area (Scott 1913) probably refers to a collection from Snelgrove, Peel County. Records from Hamilton (Macoun 1888) and Niagara Falls (Zenkert 1934) have not been substantiated but are probably authentic.



Map 143. *Cinna arundinacea*. All known Canadian records from the area covered by the map are plotted.

2. *Cinna latifolia* (Trev.) Griseb.

Fig. 18, Plate 41, Map 144

drooping woodreed, nodding wood grass

Cinna latifolia is a widespread grass that occurs from coast to coast across Canada and has a more general distribution in Ontario than the preceding species. It is characteristic of coniferous and mixed woodland on rocky ground and is often conspicuous when growing from the moist crevices of rock faces. Following clearing of the forest, it usually grows luxuriantly. It is abundant in the upper Ottawa River, Algonquin Park, Temagami area, along the northern shore of Lake Superior, and in the Kenora District. It probably also occurs throughout much of the wooded country of the far north, although collections are known only from the mouths of the Attawapiskat, Albany, and Moose rivers draining into James Bay. However, the lack of specimens from Manitoulin Island and northward from Georgian Bay probably reflects genuine absence.

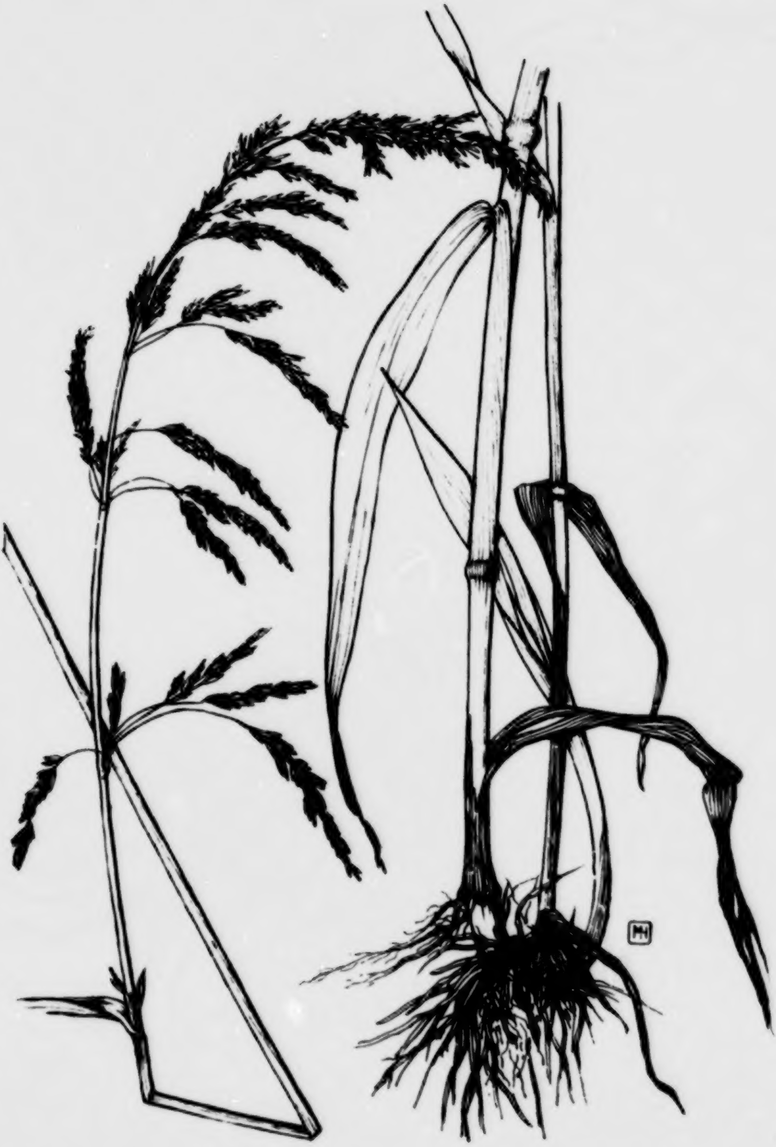
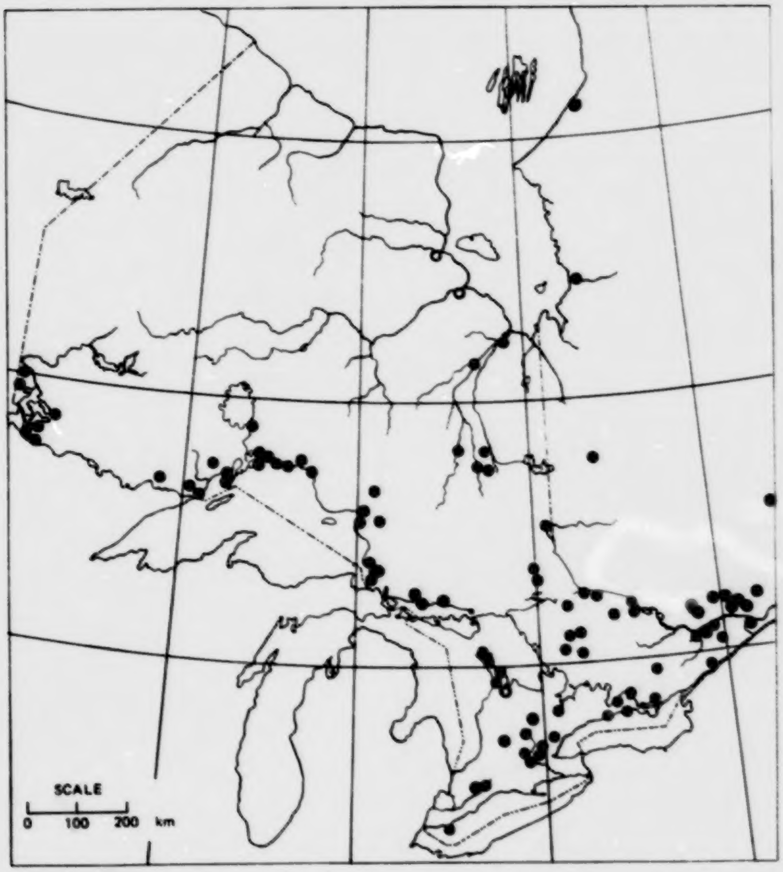


Fig. 18. *Cinna latifolia* (Trev.) Griseb.

In the counties south of the Bruce Peninsula, it is rather rare and no specimens are known from several well-collected areas. It was possibly more abundant at one time in this area and may have disappeared in some places owing to clearing, grazing, and alteration of habitats. For example, the only specimens from Point Pelee and London are dated 1879 and 1901 respectively.



Map 144. *Cinna latifolia*. All known Canadian records from the area covered by the map are plotted.

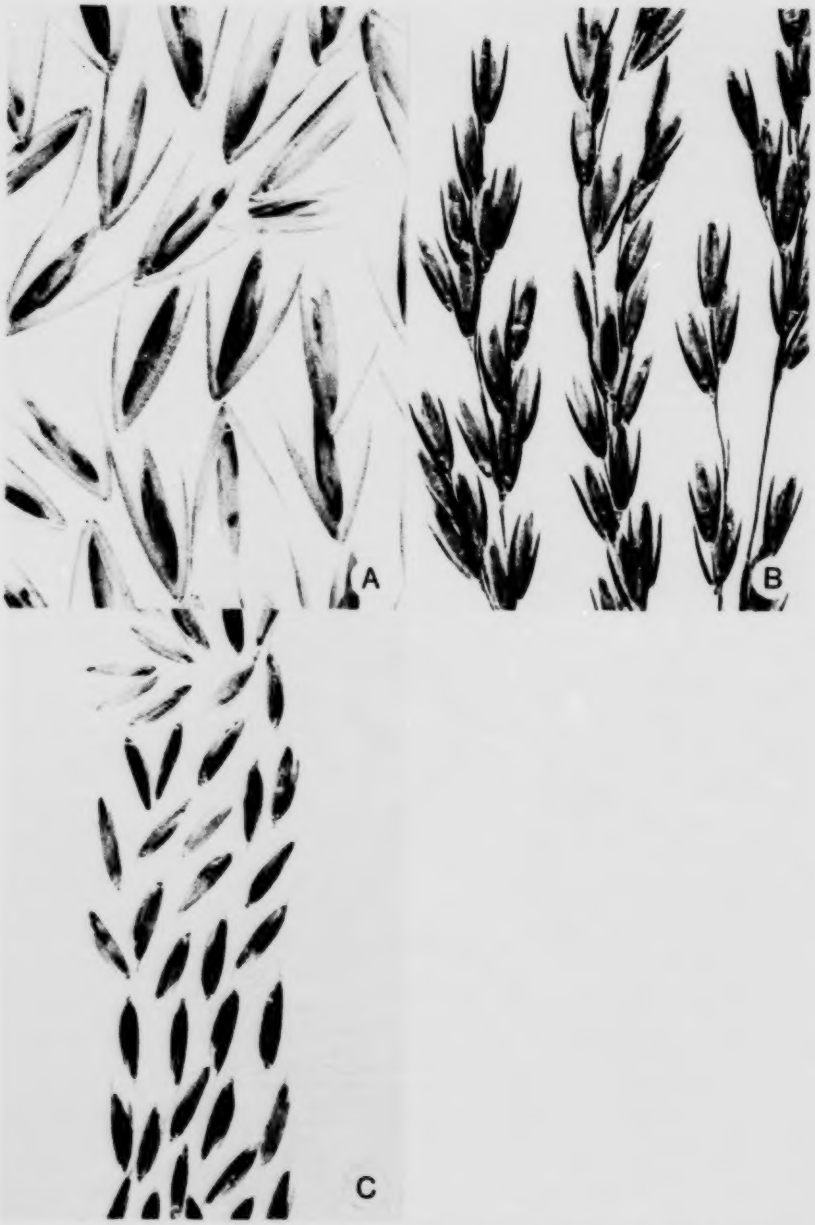
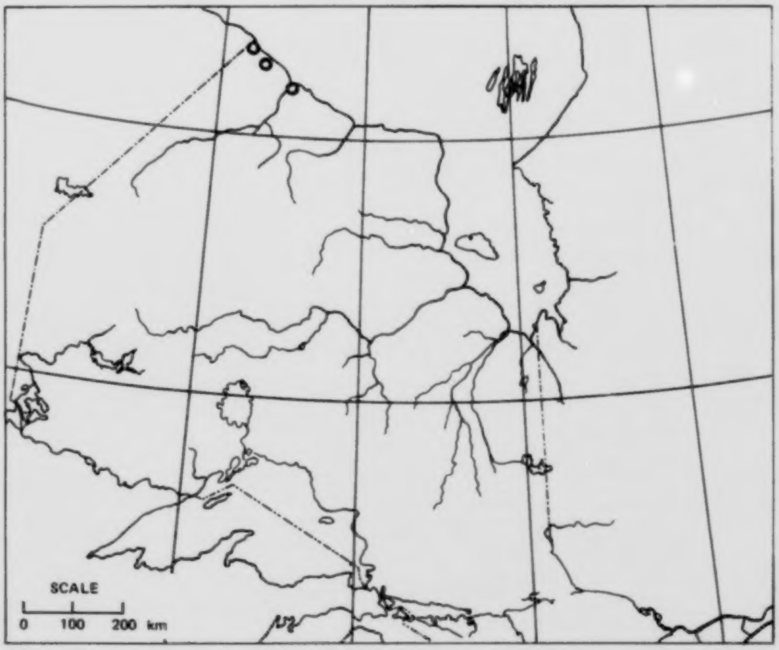


Plate 41. *A*, Spikelets of *Cinna arundinacea* (Dore 24599); *B*, Panicle of *C. latifolia* (Dore 18485); *C*, Florets of *C. latifolia* (Dore 19462).

43. Arctagrostis Griseb.

A strongly rhizomatous grass, usually 30–60 cm high, with 2 leaf blades prominent on the smooth, stiffly erect stem. Leaf blades short, broad, sharply pointed, scabrous on both surfaces; ligule membranous, 3–4 mm long. Spikelets numerous in a dense, closed, usually dark purple panicle. Glumes about 3 mm long, about one-half the length of the floret, rounded on the back, firm, with a narrow membranous margin. Lemma and palea similar in texture to each other and to the glumes, uniformly hispidulous; palea often slightly longer than lemma, with the two veins obscure and rather close together.



Map 145. *Arctagrostis latifolia.* All known records from the area covered by the map are plotted.

1. *Arctagrostis latifolia* (R. Br.) Griseb.

Map 145

arctic grass, polar grass

An abundant grass throughout the northern tundra, *Arctagrostis latifolia* extends into Ontario for only a few kilometres along the Hudson Bay shore from the Manitoba boundary to the Severn River where it grows sparsely in the dune meadows. The plants from Ontario are all referable to *A. latifolia* in the narrow sense, which is apparently always octoploid ($2n = 56$). The related *A. arundinacea* (Trin.) Beal (= *A. latifolia* var. *arundinacea* (Trin.) Griseb.) is tetraploid and does not extend eastward beyond the Mackenzie District and the Rocky Mountains.

44. Alopecurus L.

Perennial grasses. Foliage hairless, often glaucous; blades flat; sheaths loose, the upper often inflated; ligule membranous. Panicles densely flowered, spike-like, resembling ***Phleum*** but differing in the dorsally attached lemma awns usually extending beyond the glumes and giving the panicle a softer texture. Spikelets crowded, short-stalked, wide, laterally flattened. Glumes equal, joined together toward the base, long pubescent especially on the keels. Lemma generally shorter than glumes, thinner, awned from the back. Palea absent.

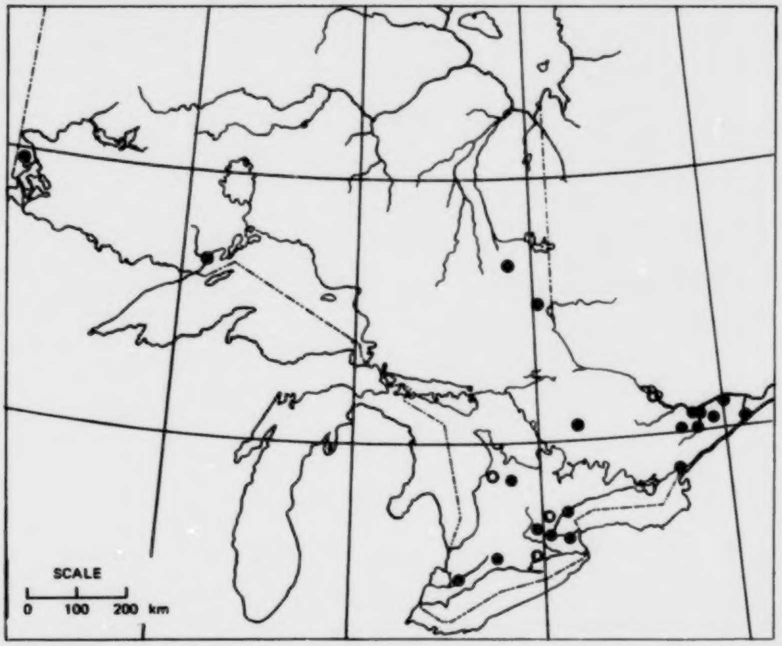
- A. Glumes woolly-pubescent all over; panicle up to 3 times as long as wide, about 10 mm wide; tundra .... 4. ***A. alpinus***
- A. Glumes conspicuously pubescent only on the keels; panicle at least 10 times as long as wide; boreal and southern regions
  - B. Spikelets about 5 mm long; panicle 7–10 mm wide; anthers 2.5–4 mm long; awns conspicuously exserted; introduced .... 1. ***A. pratensis***
  - B. Spikelets 1.8–3 mm long; panicle 2–6 mm wide; anthers 0.7–1.5 mm long
    - C. Awn shorter than or exceeding the glumes by less than 1 mm, arising from near the middle of the lemma back; glumes 1.8–2.2 mm long; anthers 0.7–1 mm long, pale yellow or orange after anthesis; native .... 2. ***A. aequalis***
    - C. Awn extending 2–3 mm beyond the glumes, arising from near the base of the lemma back; glumes 2.5–3 mm long; anthers 1.2–2 mm long, purplish; introduced, rare .... 3. ***A. geniculatus***

1. *Alopecurus pratensis* L.

Fig. 19, Plate 42, Map 146

meadow foxtail

Despite continuous attempts to establish it as a forage crop over the years, *Alopecurus pratensis* remains a rather rare grass in Ontario. The climate in general is apparently not as suitable for its success as it is in those parts of Canada near the Atlantic and Pacific coasts. Nevertheless, once established in situations of fertile and continually moist soil, it seems to persist for many years without attention. In northern Europe meadow foxtail is a popular hay and pasture species, noted for its early spring growth.



Map 146. *Alopecurus pratensis.*

In the Arboretum at the Central Experimental Farm in Ottawa where it was planted experimentally about 60 years ago, it has survived mowing and has spread conspicuously to nearby fencerows and fields. At Guelph the first specimen is dated 1905, and subsequent records indicate an increase up to the present time. During recent decades widely scattered stands, usually along roadside ditches, have been discovered. Several were in the Ottawa district; others were found at Toronto in 1933, Hamilton in 1956, Vineland in 1940, St. Thomas in 1950, Flesherton (Grey County) in 1956, and Thunder Bay in 1950. At Thunder Bay the species persists as an extensive stand for about a kilometre along the shore at Chippawa Park. White (1909) reported it as "occasional in moist meadows" in Peel County; Cruise (1969) quotes only one locality for Norfolk County ("clearing on damp soil, Port Ryerse"), but Gaiser and Moore (1966) give no record for Lambton County. More recently it has been found along Highway 401 near its eastern and western extremities. It would seem that the summer aridity of the soil, at least in the southern part of the province, has prevented its more general establishment.

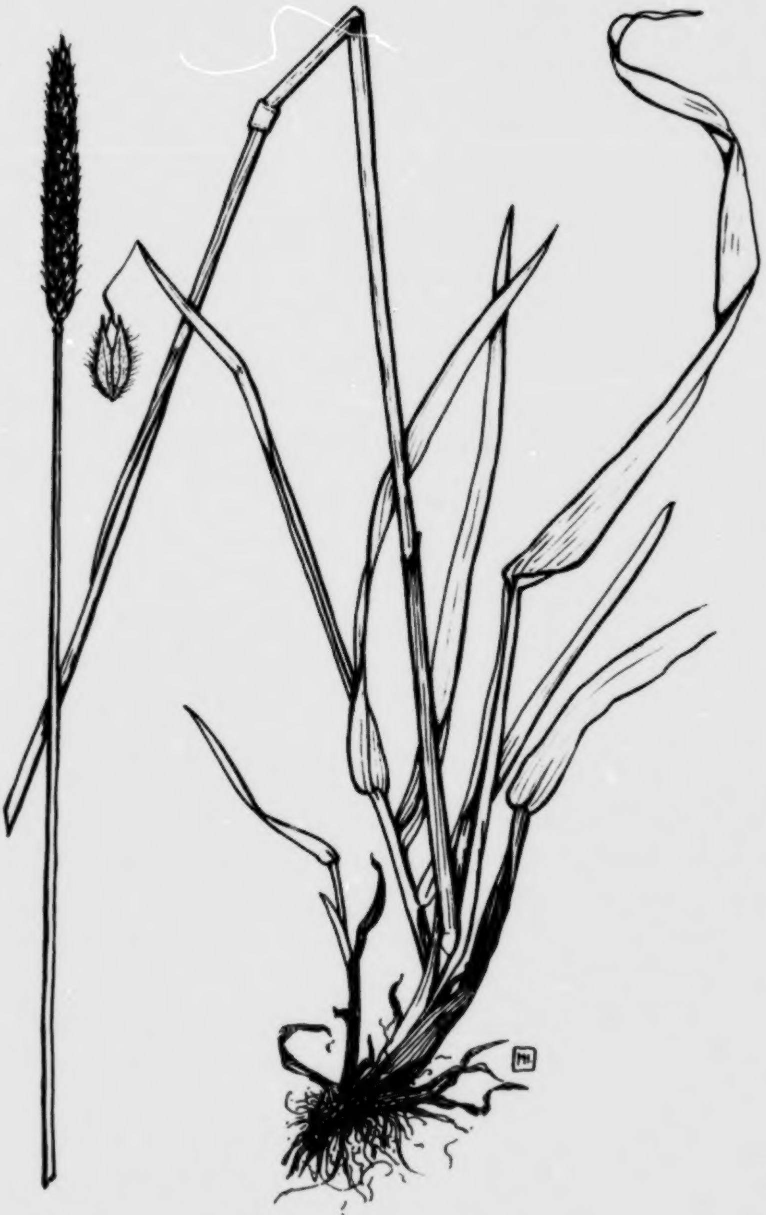


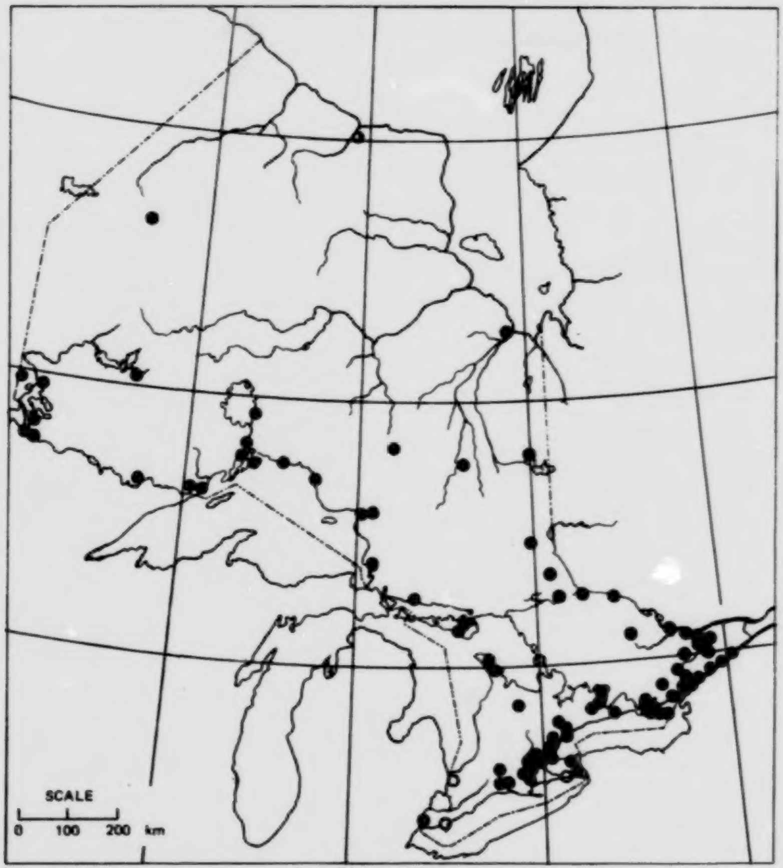
Fig. 19. *Alopecurus pratensis* L.

2. *Alopecurus aequalis* Sobol.

Plate 42, Map 147

short awn foxtail

A widespread species of the northern hemisphere, *Alopecurus aequalis* extends throughout Ontario but apparently not uniformly. There are large areas where no specimens have been collected, and the species is very scarce and scattered in other regions, especially in the north, where only three localities have been documented: Moosonee, Winisk River, and Petownikip Lake (53°N, 92°W). This native foxtail is certainly not common and,



Map 147. *Alopecurus aequalis*.

although numerous specimens exist, the annotations almost invariably indicate that it was "scarce" or "rare". The grass seems to flourish sporadically, then disappear.

The characteristic habitat of the species is marshy shores, sometimes in a few centimetres of water. The plant seems to require full sunlight, and perhaps limited competition. The ripe spikelets fall readily from the panicle leaving a naked axis. While this is starting at the apex and proceeding downwards, spikelets in anthesis may still be present at the base. Inflorescence production, too, takes place throughout the season, as in *Sphenopholis intermedia*, and branches with completely shattered panicles and with preanthesis panicles may be found in the same patch of plants. The caryopses at maturity have a soft endosperm, presumably rich in oils, like other grasses of northern latitudes.

3. *Alopecurus geniculatus* L.

Map 148

water foxtail

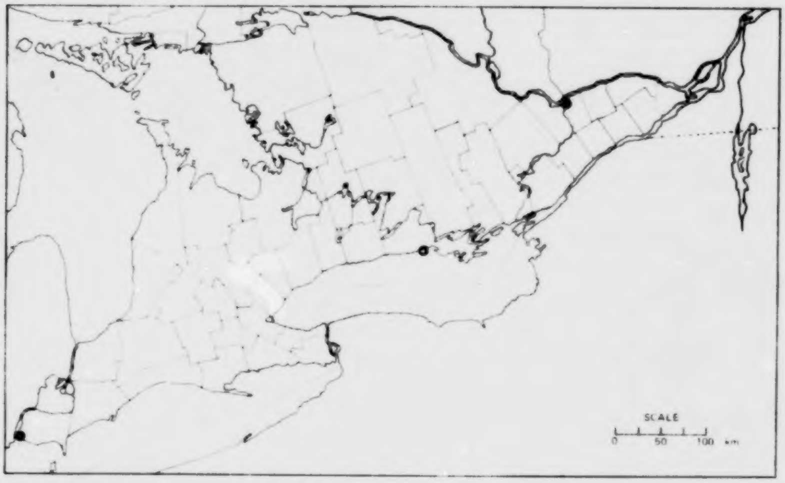
Alopecurus geniculatus is reported for Ontario in Macoun's (1888) *Catalogue*, which records it as follows: "gravelly beach at the lower end of Presqu'ile Point, Lake Ontario; muddy flats at Amherstburg, Lake Erie (Macoun)." No specimen can be found to support the Presqu'ile Point station, but a Macoun specimen from Amherstburg exists and is annotated "in ditches, June 16, 1882." This is the expected habitat of this species introduced from wet or moist localities in Europe. In the maritime parts of Canada, it is widely established and persists, but in Ontario it does not seem to survive, although it has probably been introduced on numerous occasions. Plants arising from a lawn-grass mixture survived one winter in Ottawa.

4. *Alopecurus alpinus* Sm.

Plate 42, Map 149

alpine foxtail

Only one specimen of *Alopecurus alpinus* is known to have been collected within Ontario. This was found at Fort Severn on Hudson Bay in 1940, although Macoun (1888) reports the species from "between Fort Severn and York Factory." Another locality at the mouth of Black Duck River is actually a few kilometres into Manitoba. It also occurs on the east coast of James Bay, at Fort George in Quebec. This grass is characteristic and common in parts of the Canadian Arctic, but farther south is apparently unable to survive competition from other species. Under cultivation at Ottawa and Guelph, it readily grows to maturity.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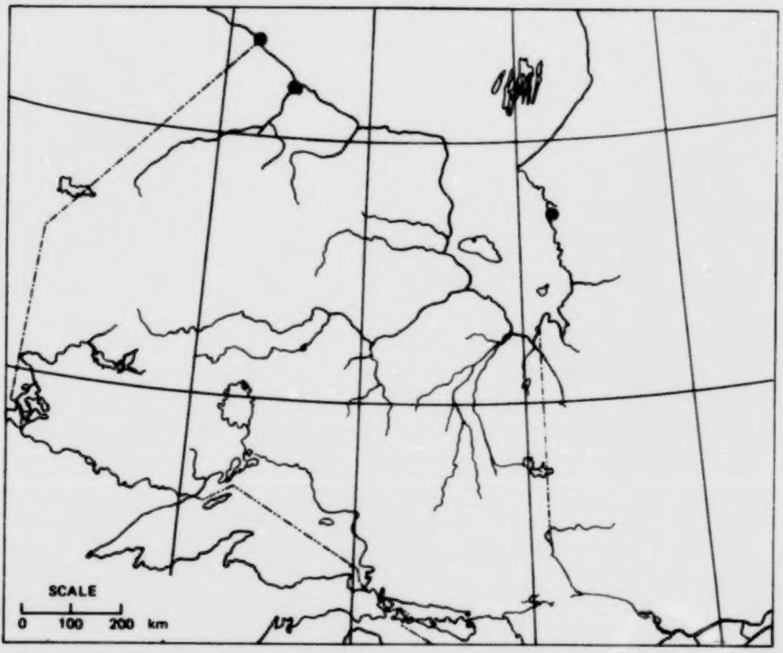
Map 148. *Alopecurus geniculatus.*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Map 149. *Alopecurus alpinus.* All known Canadian records from the area covered by the map are plotted.

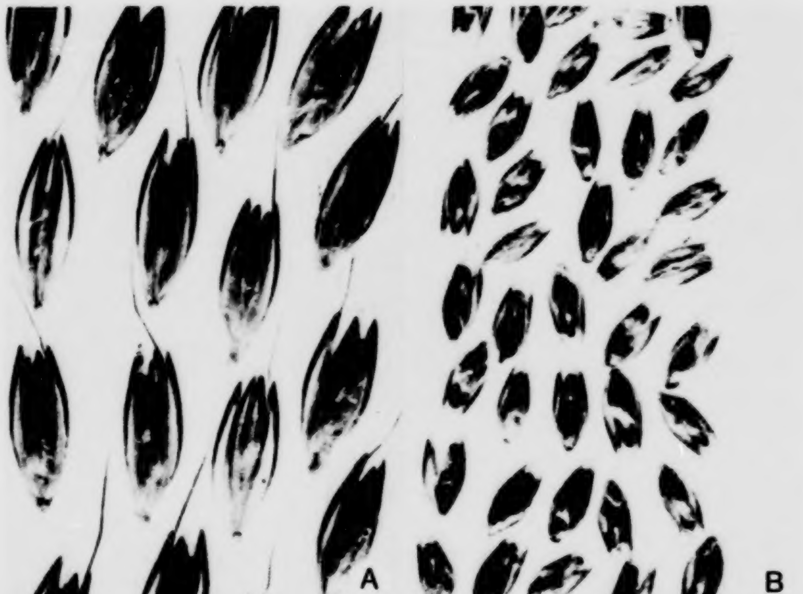


Plate 42. *A*, Spikelets of *Alopecurus pratensis* (Dore and Lindsay 10821); *B*, Spikelets of *A. aequalis* (Dore 21374); *C*, Spikelets of *A. alpinus* (Savile 3685); *D*, Spikelets of *Polypogon monspeliensis* (Mosquin in 1953).

45. Polypogon Desf.

Annuals. Foliage scabrous; upper sheath inflated; ligule long, white, veined, hispidulous on back. Panicle dense, spike-like or lobed, pale green, softly bristled. Spikelets 1-flowered, breaking away below the glumes. Glumes equal in length, coarsely scabrous, long-awned from between a somewhat bifid tip; awn slender, straight. Lemma thin-membranous, smooth, shiny, with a short deciduous awn.

1. *Polypogon monspeliensis* (L.) Desf.

Plate 42

rabbit-foot grass

A weedy annual, *Polypogon monspeliensis* originates in Europe and is sparsely introduced to most Canadian provinces, although it is fairly abundant in southern British Columbia. The only Ontario records are at Swansea in 1912 and St. Thomas in 1913, the latter reported by Fyles (1914) under the name of "beard grass." In a personal communication 40 years later, the collector indicated that the grass had not persisted. The species is not important in the province and seems unable to become established here as a weed.

46. Phleum L.

Tall perennial grasses. Foliage hairless except for sparse cilia on the blade collar; blades flat; ligule membranous, white, generally with a notch at each side. Panicles dense, firm, cylindrical, and spike-like. Spikelets 1-flowered, laterally flattened. Glumes equal in length, united only at base, coarsely ciliate on the keels, abruptly contracted into a short firm awn. Lemma shorter than glumes, membranous, awnless, white or silvery, falling away with grain enclosed.

Awn tips of glumes about 1 mm long, firm; inflorescence more than 5 times as long as wide; base of culm swollen, often bulb-like; introduced and extensively naturalized .... 1. ***P. pratense***

Awn tips of glumes 2–3 mm long, slender; inflorescence 1–4 times as long as wide; base of culm not conspicuously swollen; native; far north only .... 2. ***P. alpinum***

1. *Phleum pratense* L.

Fig. 20, Plate 43, Map 150

timothy

A well-known grass, *Phleum pratense* is perhaps our most important forage species and, at one time, was the chief grass sown with clover in hay meadows throughout Ontario. As an alien species of high adaptability, it has escaped from cultivation throughout the settled parts of the province and now persists on roadsides, in fields, and in vacant land. It is also found in pastures and lawns, although under close grazing or mowing it tends to decline. To the north, specimens have been collected at Moosonee and at Attawapiskat. It is said to occur at all the other settlements around James Bay (Dutilly et al. 1954), although it must be approaching its northern climatic limit in this area.

P. pratense was one of the first grasses to spring up in any new clearing in the woods in the "horse-power" days when grains were dropped from the hay feed and others were carried far along wood roads in manure. The grains, although small and as delicate looking as those of other grasses, seem better able to resist digestion by large herbivores and get transported to out-of-the-way habitats. Stray plants may turn up in swamps and wet

46. Phleum L.

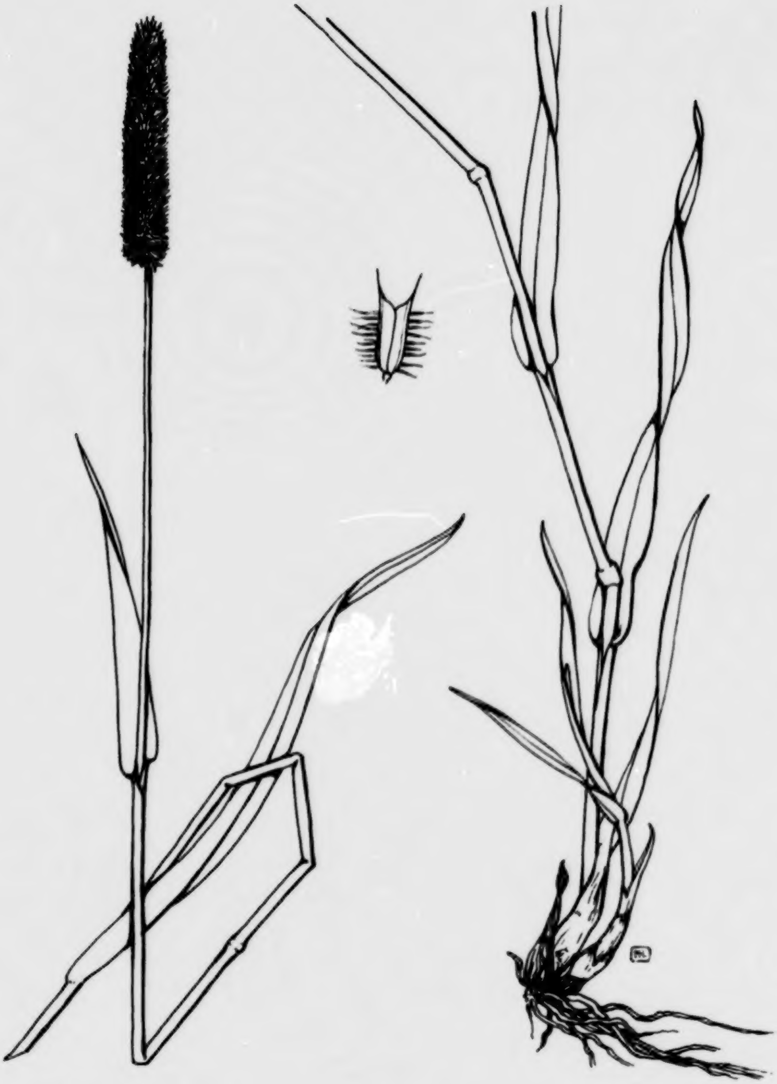
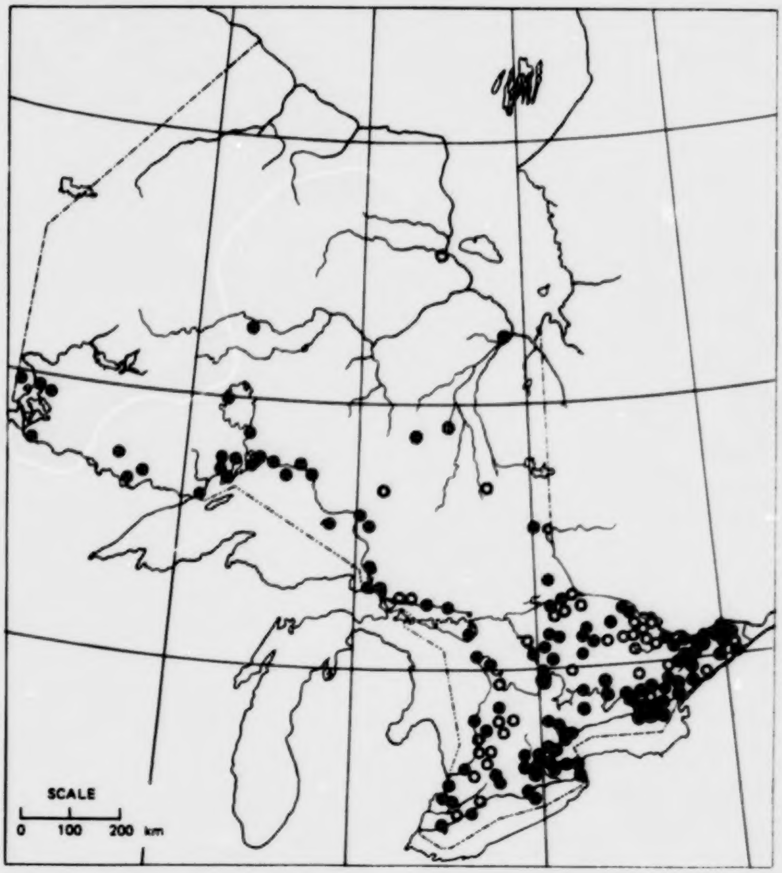


Fig. 20. ***Phleum pratense*** L.

woods, or on sand dunes and beaches. Individual plants from woodland paths and exposed cliffs are often reduced in size and produce small panicles; these have frequently been misidentified as *P. alpinum*.



Map 150. ***Phleum pratense***.

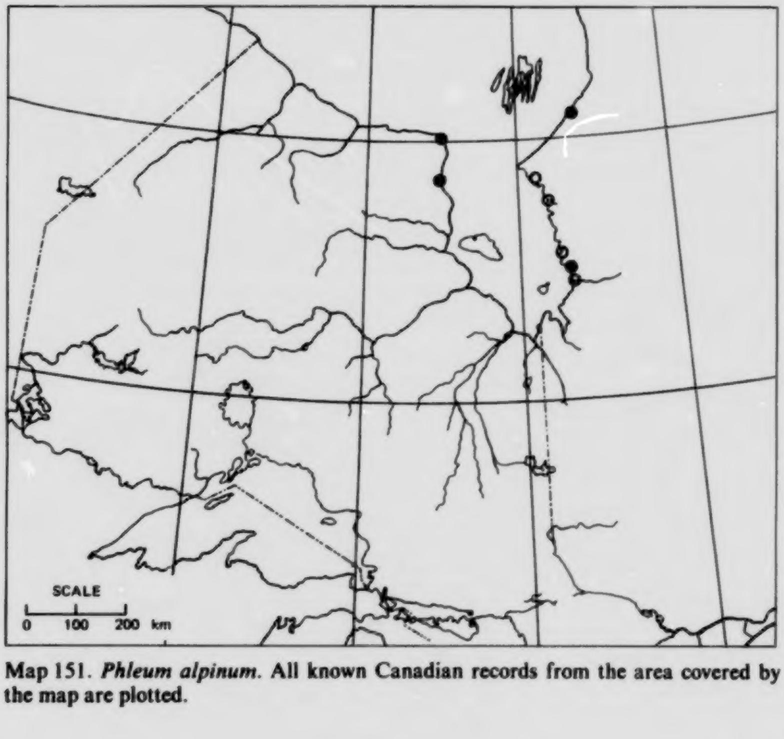
Plants with a sheathless leaf, 0.5–2 cm long, arising from the base of the panicle have been called f. *bracteatum* A. Braun ex Ascherson & Graebner. This particular form has been reported from several localities in Quebec by Dansereau (1945). Such plants are known from a number of scattered localities across Ontario. Sometimes plants with glumes or other floral parts converted into leaf-like structures are seen. These usually appear late in the season and are associated with panicle damage caused by cutting, trampling, or burying earlier in the year. The condition is particularly common in moist habitats or in wet seasons and seems to be a direct response to environmental conditions, although such plants have been called f. *viviparum* (S. F. Gray) Louis-Marie.

2. *Phleum alpinum* L. (*P. commutatum* Gaudin)

Plate 43, Map 151

alpine timothy

Phleum alpinum is represented in Ontario only by collections from Cape Henrietta Maria and at the mouth of Lake River on James Bay about 40 km to the south. Many more collections have been made on the Quebec side of James and Hudson bays and the species is abundant on the mountains of the Gaspé and Cordillera. Published records from the Lake Superior area (Macoun 1888, Taylor 1938) all seem to be based on depauperate specimens of *P. pratense*.



Map 151. ***Phleum alpinum*****. All known Canadian records from the area covered by the map are plotted.**

Following Nordenskiold (1945), the diploid populations of this group, which are restricted to the European Alps, are distinguished as a separate species from the panarctic tetraploid populations. For this reason the name ***P. commutatum*** Gaudin has been applied recently to this latter species but we consider the typification proposed by Bowden (1960*c*, p. 286) more accurate. This retains the name ***P. alpinum*** for the widespread tetraploid that includes all the North American populations.

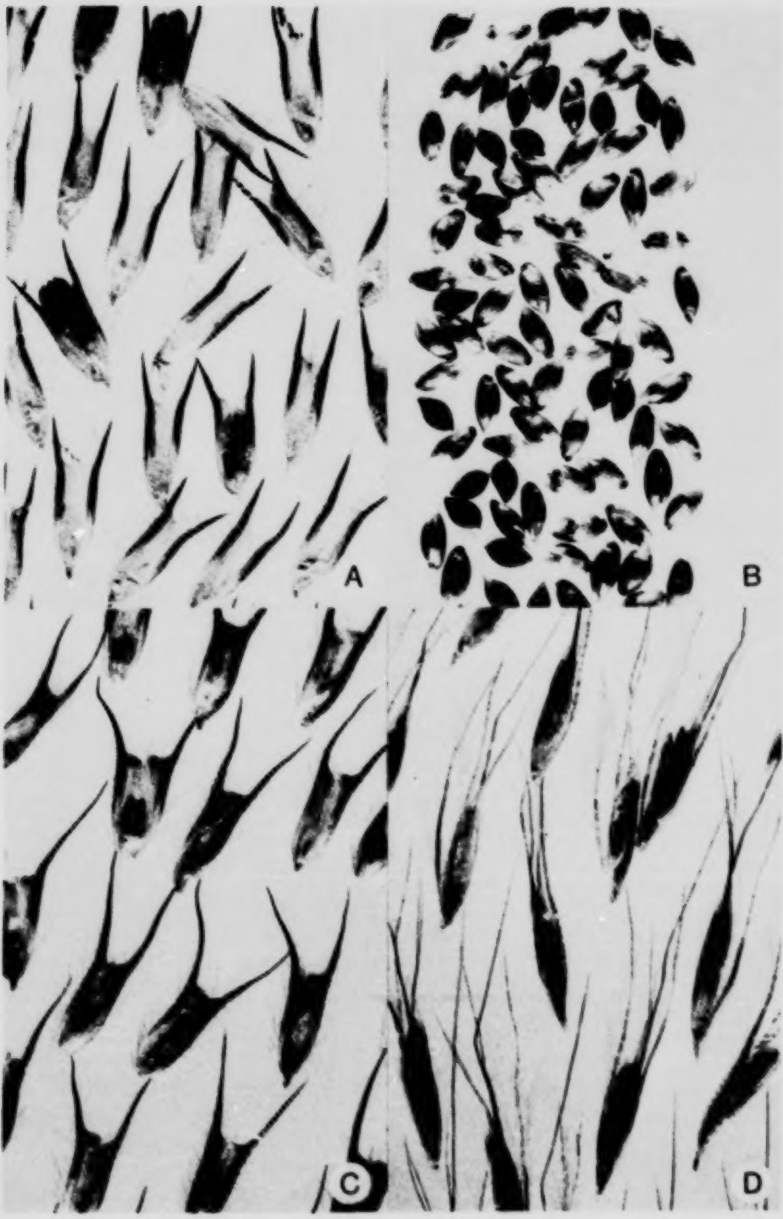


Plate 43. *A*, Spikelets of ***Phleum pratense*** (Ropke 390); *B*, Florets and caryopses of ***P. pratense*** (Minshall 1155); *C*, Spikelets of ***P. alpinum*** (Rousseau 883); *D*, Spikelets of ***Lagurus ovatus*** (James 2423).

47. Lagurus L.

Annuals. Foliage soft-velvety, pubescent; ligule thin-membranous, hairy on the back and margins. Panicles pale, dense, ovoid or oblong. Spikelets 1-flowered; rachilla pilose under the floret, produced beyond the palea as a bristle. Glumes subequal, 1-nerved, gradually tapering to a plumose awn-point. Lemma shorter than glumes, glabrous, with a slender exserted awn.

1. *Lagurus ovatus* L.

Plate 43

hare's-tail grass

An ornamental annual grass with soft-woolly heads, *Lagurus ovatus* is sometimes cultivated in gardens, then dyed for dry bouquets. Specimens are known from gardens at Ottawa, Toronto, and Guelph, but plants seem to flower too late in the summer in Ontario to allow seed to set and there is no evidence of persistence from year to year.

48. Muhlenbergia Schreber

Perennial grasses of low to medium height usually with distinctive short, shallow-growing, scaly rhizomes. Panicles contracted and congested or diffuse. Spikelets 1-flowered, less than 3 mm long, exclusive of awns. Glumes generally shorter than the lemma, 1-nerved, keeled. Lemma membranous, obscurely nerved, acute, awnless or long-awned from tip, usually pilose, often color-blotched. Foliage hairless; sheaths open to base; auricles absent; ligule membranous.

A. Rhizomes absent or, if present, deeply penetrating the soil, slender (less than 1.5 mm diam), with naked internodes; base of plant with elongate decumbent culms, rooting at nodes; leaf blades 1–4 mm wide

  B. Glumes less than 0.2 mm long, often obsolete; lemma pilose at base, long-awned; spikelets green-blotched or purple tinged; leaf blades 2–4 mm wide; sandy or disturbed soil; southern Ontario .... 7. ***M. schreberi***

  B. Glumes 0.3–1.5 mm long; lemma glabrous or minutely pubescent, never pilose, awnless or mucronate; spikelets purple or lead-colored; leaf blades 1–2 mm wide

    C. Panicle contracted, spikelets on erect pedicels 0.5–2 mm long; culms minutely nodulose; gravelly river shores; James Bay region .... 10. ***M. richardsonis***

    C. Panicle open and diffuse; spikelets on spreading pedicels 2–15 mm long; culms smooth

      D. Rhizomes absent; panicle much less than half as wide as long; glumes less than half as long as spikelet; bogs or granitic rocks; upper Ottawa Valley and Lake Superior regions .... 8. ***M. uniflora***

      D. Rhizomes present; panicle becoming more than half as wide as long; glumes half to as long as spikelet; salt flats, Windsor .... 9. ***M. asperifolia***

A. Rhizomes short, superficial, more than 2 mm in diam, with overlapping scales; culms ± erect, not rooting at nodes; leaf blades usually more than 5 mm wide, at least some more than 3 mm

  E. Glumes wide below, abruptly pointed above; culms simple or sparingly branched

    F. Lemma awnless or shortly awn-tipped; leaf blades usually less than 5 mm wide; sheaths and internodes glabrous; Ohio shore .... ***M. sobolifera*** **(p. 331)**

    F. Lemma long-awned; leaf blades usually more than 8 mm wide; sheaths and internodes hispid; southern Ontario .... 6. ***M. tenuiflora***

  E. Glumes tapering gradually from base to apex, produced into an awn-like tip; culms generally much-branched

G. Panicles usually solitary, terminal, erect, firm and somewhat "bristly", densely spikeleted but interrupted at base, with short, stiff branches; glumes longer than the lemma, stiffly long-awned

  H. Leaf sheaths rounded on back, close, the midvein not conspicuous; culm internodes retrorse-hispidulous generally throughout; ligule generally 0.3–0.5 mm long; anthers 1–1.5 mm long; grain 1.2–1.5 mm long; widely distributed .... 4. ***M. glomerata***

  H. Leaf sheaths compressed, loose, with prominently raised midvein; culm internodes glabrous or sometimes slightly hispidulous below the nodes, often shiny; ligule 0.8–1.5 mm long; anthers 0.5–0.8 mm long; grain 1.8–2.2 mm long; north shore of Lake Superior and westward .... 5. ***M. racemosa***

G. Panicles numerous, both terminal and axillary, rather soft and arching with evident branches and scarcely crowded spikelets; glumes shorter than or equal to body of the lemma, acuminate to slenderly long-awned

  I. Culm internodes glabrous; stems generally somewhat zigzag, often geniculate and rooting at base, freely branching in the lower part making the whole plant look bushy and top-heavy; panicles generally partly inserted in the flattened and loose sheaths; grain easily loosened .... 1. ***M. frondosa***

  I. Culm internodes densely retrorse-hispidulous; stems erect with several ± strict branches bearing well-exserted panicles; sheaths cylindrical and close

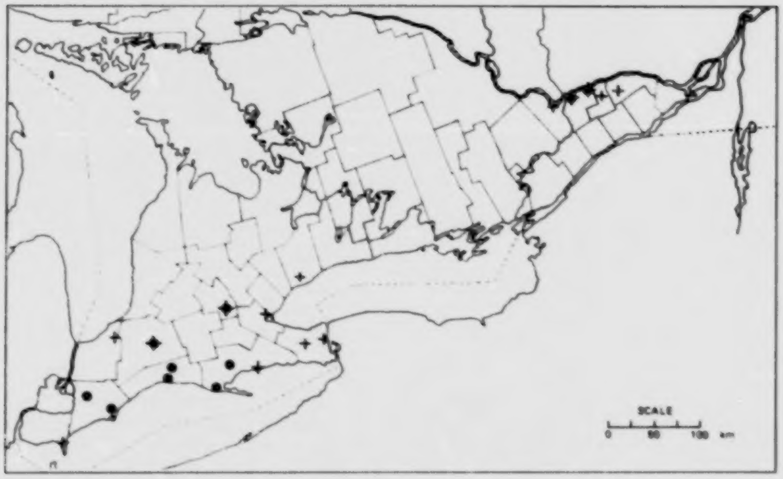
    J. Leaf blades ascending to spreading, firm; panicles rather firm, with the spikelets on short pedicels and concentrated into glomerules; grain firmly enclosed in lemma and palea; lemma awnless or long-awned .... 2. ***M. mexicana***

    J. Leaf blades spreading to arching, soft; panicles soft, slender, loosely flowered, the spikelets mostly long-pediceled and not greatly congested; grain loose; lemma long-awned .... 3. ***M. sylvatica***

1. *Muhlenbergia frondosa* (Poiret) Fernald

Fig. 21, Map 152

Muhlenbergia frondosa is a species of bushy-branched sprawling plants readily recognized in the field. They have smooth culms and numerous, partially included, lateral panicles. The species was treated in earlier manuals as ***M. mexicana***, but because of the confusion in the use of the name prior to Fernald's revision (1943*b*), it is not possible to refer the older records to an appropriate species. Most published records of ***M. mexicana*** refer to ***M. frondosa***, but those from the Bruce Peninsula listed by Krotkov (1940) are in fact of ***M. mexicana*** as now understood. The species is rather abundant where it occurs, but is restricted to the southwestern counties and to the lower Ottawa Valley. At some places the species has become a weed in gardens, spreading by its short, brittle rhizomes.



Map 152. *Muhlenbergia frondosa* f. *frondosa* (•) and f. *commutata* (+). Localities where the two formae occur together are indicated by a combined symbol (⊕).

Two forms can be recognized. These differ only in whether or not the lemma is awned. Plants with awnless lemmas are placed in the typical f. *frondosa*, whereas those with awns on the lemmas are called f. *commutata* (Scribner) Fernald. The two forms often occur in the same vicinity and are sometimes found mixed in the same population. To date f. *commutata* is the only type found on the Niagara Peninsula.

2. *Muhlenbergia mexicana* (L.) Trin.

Plate 44, Maps 153 and 154

Muhlenbergia mexicana is a common, upright, much-branched plant with hispidulous culms and with lateral panicles borne on well-exserted branches. It was formerly known as *M. foliosa* (Roemer & Schultes) Trin. It usually grows along the shores of rivers and lakes but is also found in open moist woods or swamps. Considerable variability is shown, associated with the habitat. In the shade the plants are taller and green, with slender lax panicles, whereas in full sunlight they are deep purple and the panicles are more compact.

Lemmas awnless .... a. var. ***mexicana***
Lemmas with an awn 4–10 mm long .... b. var. ***filiformis***

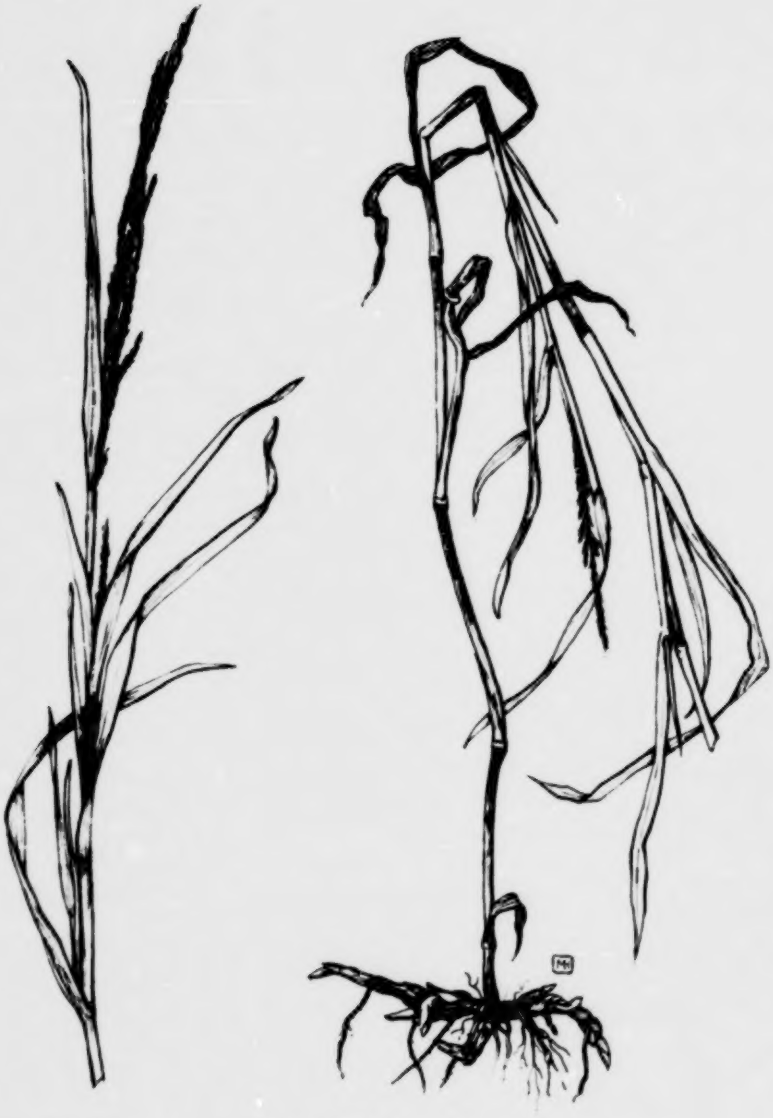
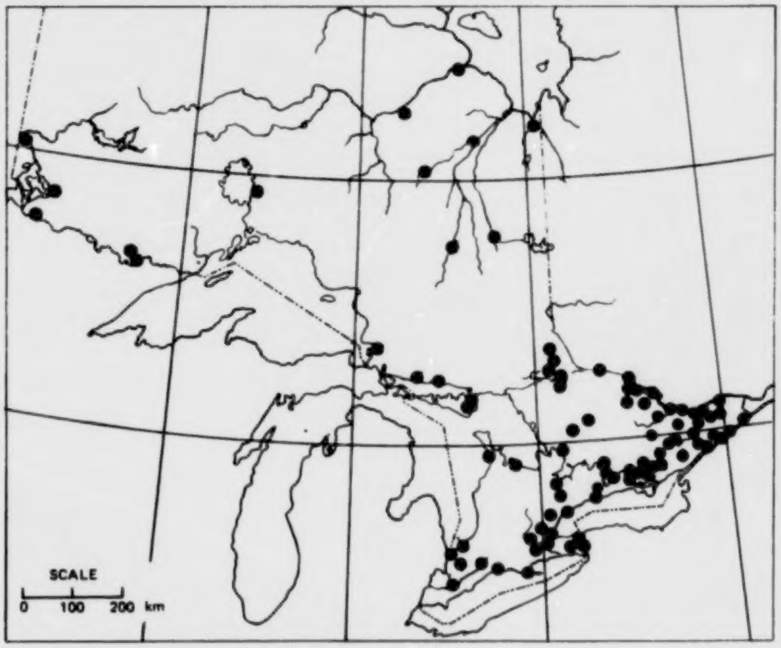


Fig. 21. ***Muhlenbergia frondosa*** (Poiret) Fernald

2a. var. *mexicana*

The typical variety, var. *mexicana*, is represented by more than twice as many specimens in Ontario as the awned variety and is distributed more widely. Its range extends beyond the Bruce Peninsula to the northern shore of Lake Huron and the eastern end of Lake Superior, beyond York and Waterloo counties to Middlesex and Lambton counties, and to Norfolk County and the Niagara area. Only awnless plants have been collected around Lake Superior and in the areas to the north, as well as along the St. Lawrence River in the southeastern counties. Both varieties occur again in the far west adjacent to Manitoba.

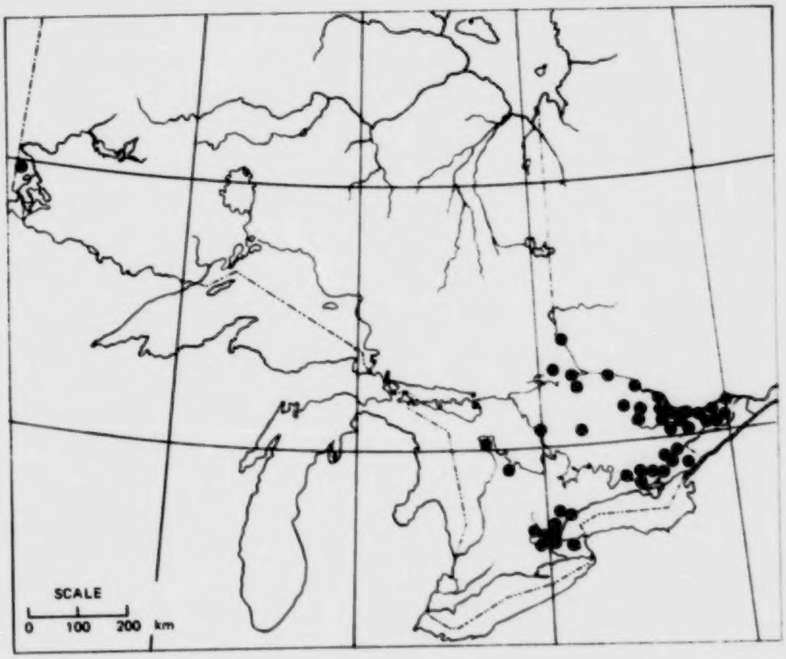


Map 153. ***Muhlenbergia mexicana*** var. *mexicana*.

2b. var. *filiformis* (Willd.) Scribner (*M. mexicana* f. *ambigua* (Torrey) Fernald)

Although frequently found growing with var. *mexicana*, as it does in the Ottawa Valley and adjacent areas, var. *filiformis* is generally more restricted in its range. Shade forms have been confused with *M. frondosa* f.

commutata or misidentified as *M. sylvatica*. These awned plants have usually been treated as a form (f. *ambigua*), but because of the differences in their range they are considered here at varietal rank.

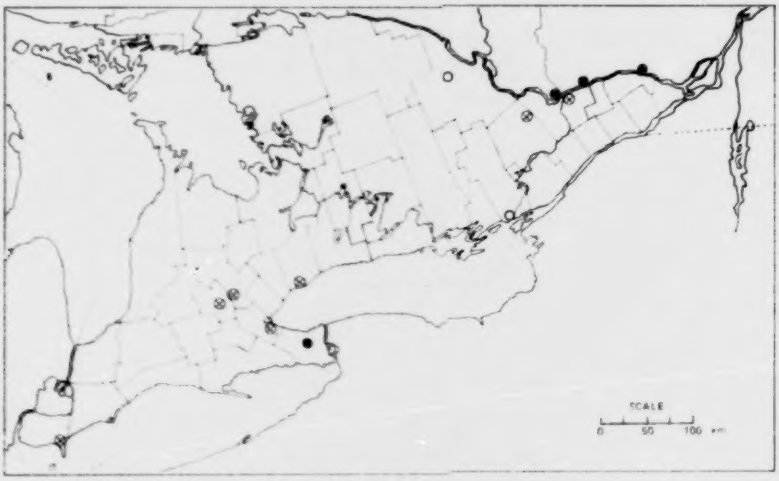


Map 154. *Muhlenbergia mexicana* var. *filiformis*.

3. *Muhlenbergia sylvatica* (Torrey) Torrey

Map 155

Many specimens from Ontario have been filed under *Muhlenbergia sylvatica* or its synonym *M. umbrosa*, and most early lists of species (Macoun 1888, Dodge 1914, Scott 1913, Stroud 1941, Montgomery 1945) record it. All, however, seem to be in error, because the plants involved are referable to shade forms of *M. mexicana* var. *filiformis* or *M. frondosa* f. *commutata*. The only authentic occurrence in the province appears to be at Effingham, Niagara Regional Municipality, where it was collected in 1940 by H. M. Harrison and originally identified as "*M. foliosa*." The species also occurs along the shores of the lower Ottawa River, but all localities are on the Quebec side and, for the most part, in an area now flooded.



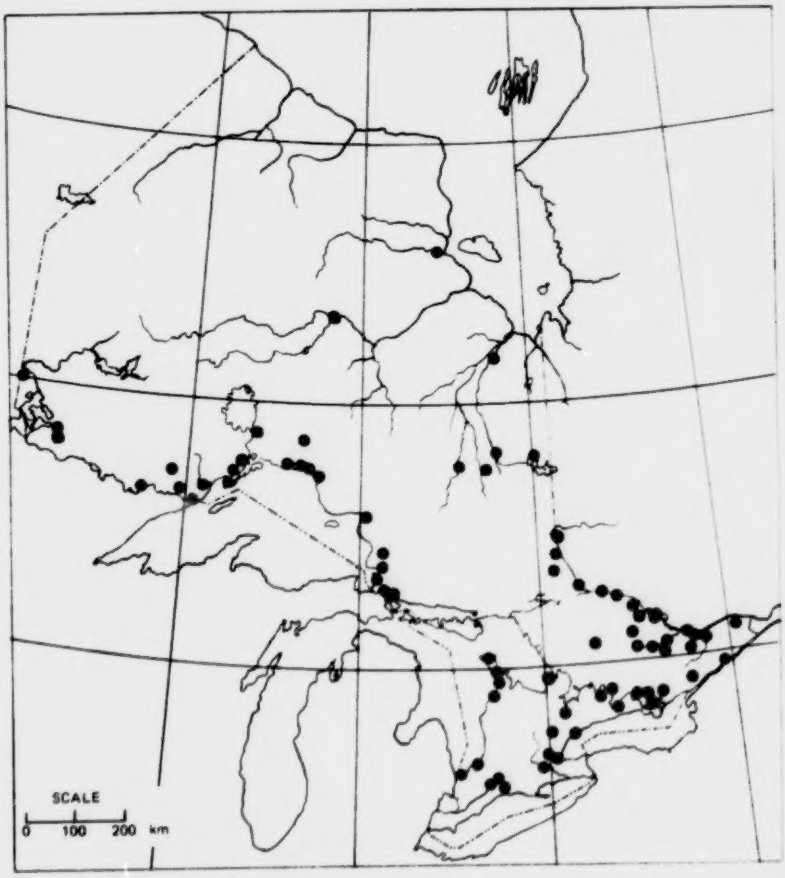
Map 155. *Muhlenbergia sylvatica*. All known Canadian records from the area covered by the map are plotted. The records that have been confirmed are indicated by a solid circle (•); those found to be erroneous are indicated by a cross in an open circle (⊗); and those records for which no substantiating specimen has been found are indicated by an open circle (○).

4. *Muhlenbergia glomerata* (Willd.) Trin. (*M. racemosa* (Michaux) Britton, E.E. Sterns, & Poggenb., pro parte)

Plate 45, Map 156

Muhlenbergia glomerata was formerly confused with and included in *M. racemosa*, but the distinctions between them, pointed out by Fernald (1943*b*), are clear-cut. However, his separation of var. *cinnoides* (Link) F. J. Hermann, to which most Ontario plants would belong, is not satisfactory and is not adopted here.

The species is a frequent and characteristic grass of crevices in exposed granitic rocks and of wet sandy shores or plains from the upper Ottawa Valley to the Clay Belt and the rivers flowing into James Bay. It is also abundant along the north shore of Lake Superior and in the Kenora District. Further exploration may show that it extends throughout the coniferous forest belt. In the southern counties and the Bruce Peninsula where calcareous soils predominate, it is confined to localized acidic or boggy habitats, and consequently it is much less widespread. In these areas there are apparently large sections from which the species is absent.

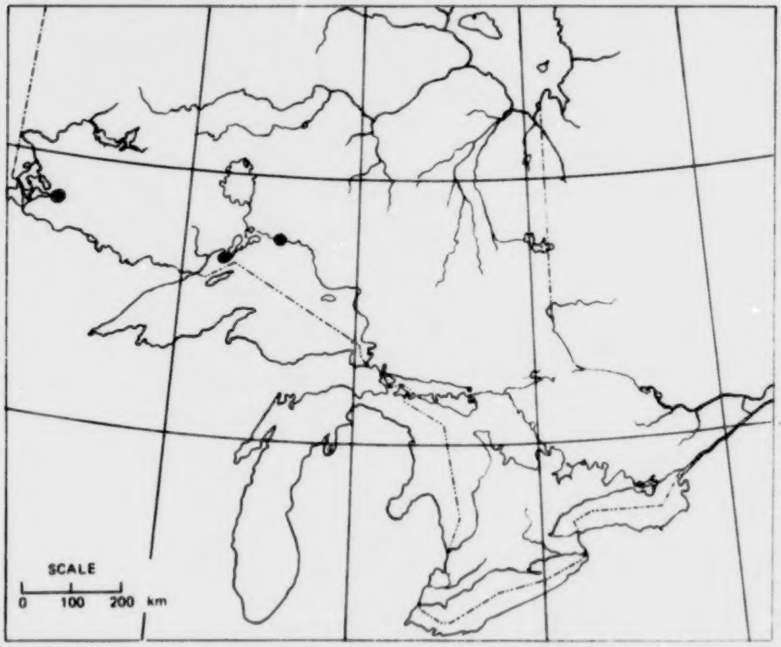


Map 156. *Muhlenbergia glomerata.*

5. *Muhlenbergia racemosa* (Michaux) Britton, E.E. Sterns, & Poggenb.

Map 157

Known only from a few localities in northern Ontario, *Muhlenbergia racemosa* has been found on talus slopes or thin soil at Thunder Cape, and on the railway at Schreiber, both on the north shore of Lake Superior in the Thunder Bay District. It has also been collected on warm ledges of Kakagi Lake, Kenora District, near the Manitoba border. The species occurs commonly from southern Manitoba westward.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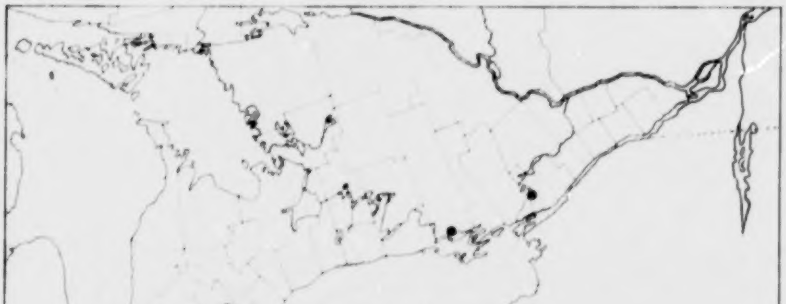
Map 157. *Muhlenbergia racemosa.*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Map 158. *Muhlenbergia tenuiflora.*

6. *Muhlenbergia tenuiflora* (Willd.) Britton, E.E. Sterns, & Poggenb.

Map 158

Muhlenbergia tenuiflora is a delicate species, which is very rare in the province, and undoubtedly becoming scarcer. Its natural habitat is moist, rocky places in woodland. The early specimens date from before 1910: near Belleville in 1874; Queenston Heights and Niagara Falls in 1876; Galt (Cambridge) in 1897 and 1901; and Foster's Flats, Niagara in 1901. It was not until 1948 that the species was collected again, at Niagara Gorge by B. Miller. In 1960, R. Hainault discovered it on the rocks near Jones Falls, Leeds County, a new and interesting locality. This species is undoubtedly a survivor from xerothermic times.

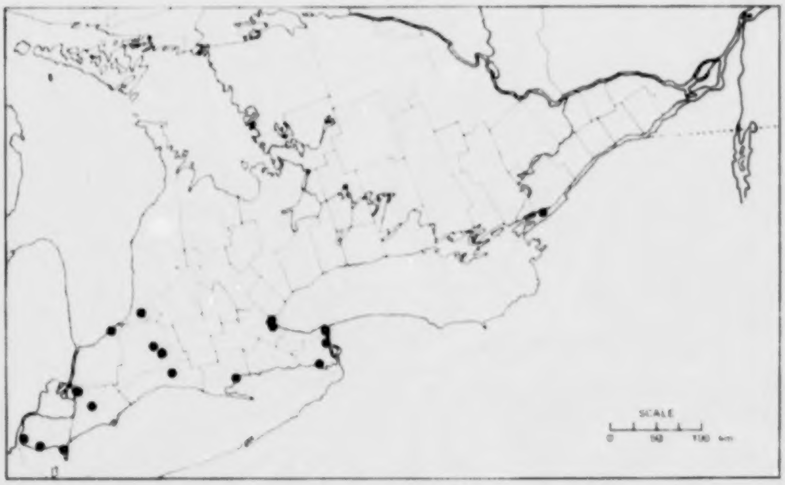
***Muhlenbergia sobolifera* (Muhl.) Trin.**–This species is reported from the Ohio shore opposite Point Pelee by Dodge (1914) and may be expected in adjacent Ontario.

7. *Muhlenbergia schreberi* J.F. Gmelin

Map 159

nimble will

Originally *Muhlenbergia schreberi* was present only in sandy woods along the shores of Lake Erie and the adjacent drainage area, but since the turn of the century it has spread to disturbed habitats elsewhere in southwestern Ontario.



Map 159. *Muhlenbergia schreberi.*

In time it will probably become a prevalent weed of streets and waste places throughout this part of the province.

8. *Muhlenbergia uniflora* (Muhl.) Fernald

Plate 45, Map 160

Muhlenbergia uniflora is a distinctive but elusive species with its minute spikelets in a delicately branched and diffuse panicle. It was not collected in Canada until 1900, when it was found by Macoun at Petawawa Falls, Renfrew County (Macoun 1910). It was 31 years later that the next specimen in Ontario was collected, but now it is known from almost 30 localities.

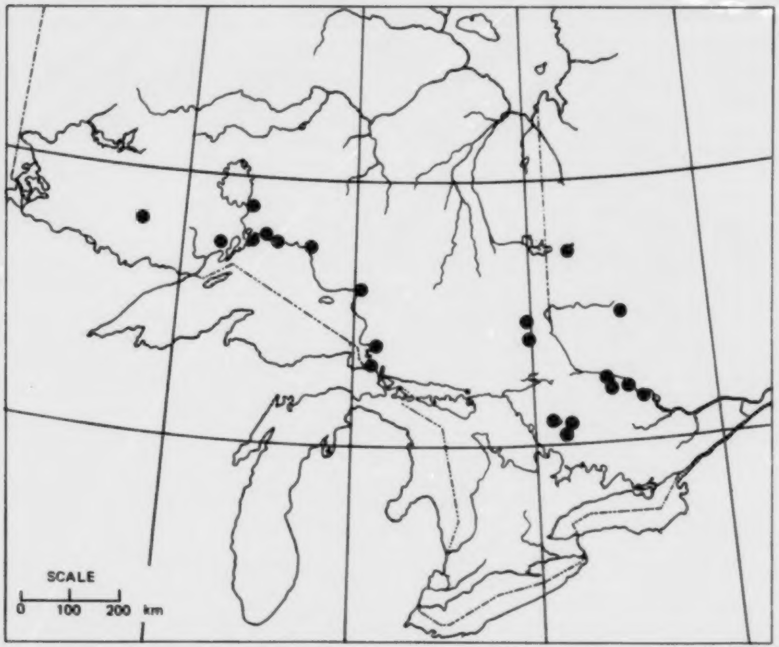
The species ranges from Newfoundland and Nova Scotia where it is abundant, across central Quebec to the Thunder Bay District of Ontario, with possibly a break in the area north of Lake Huron. It grows in bog meadows, where its presence is often obscured by other plants, and on the oozy, often inaccessible shores of lakes. Sometimes it spreads to wet roadway fill at the edge of a bog, where it forms close mats by the rooting of its short culm branches.

9. *Muhlenbergia asperifolia* (Nees & Meyen ex Trin.) Parodi

Map 161

scratch grass

Widely distributed in western North America on damp, often alkaline soils, *Muhlenbergia asperifolia* was first discovered in Ontario in 1975 on open saline ground near the Windsor Salt Factory on the western edge of the city of Windsor. It is evidently an introduction there and was found with *Spartina patens* and other saline species not known elsewhere in Ontario. A second discovery was made in 1976 on open alkaline soil in a railway yard near Niagara Falls (Catling et al. 1978).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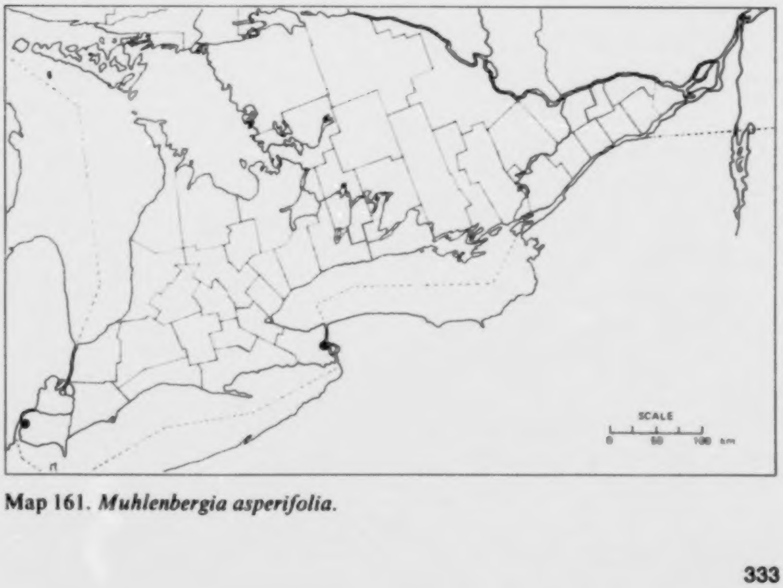
Map 160. *Muhlenbergia uniflora* All known Canadian records from the area covered by the map are plotted.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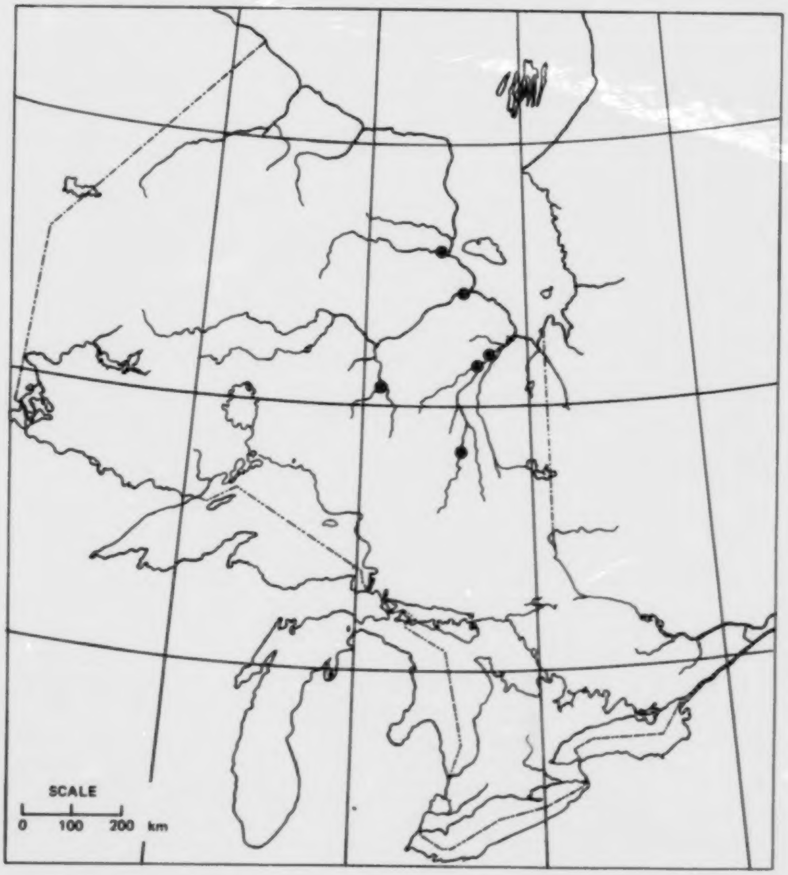
Map 161. *Muhlenbergia asperifolia.*

10. *Muhlenbergia richardsonis* (Trin.) Rydb.

Map 162

Muhlenbergia richardsonis is known in Ontario only from the gravelly or rocky banks of rivers flowing into James Bay. The species is widespread in the Prairie Provinces and seems to persist in Ontario only in open habitats where floodwaters scour away other vegetation. It is also found in similar habitats in New Brunswick and Gaspé.



Map 162. *Muhlenbergia richardsonis.*

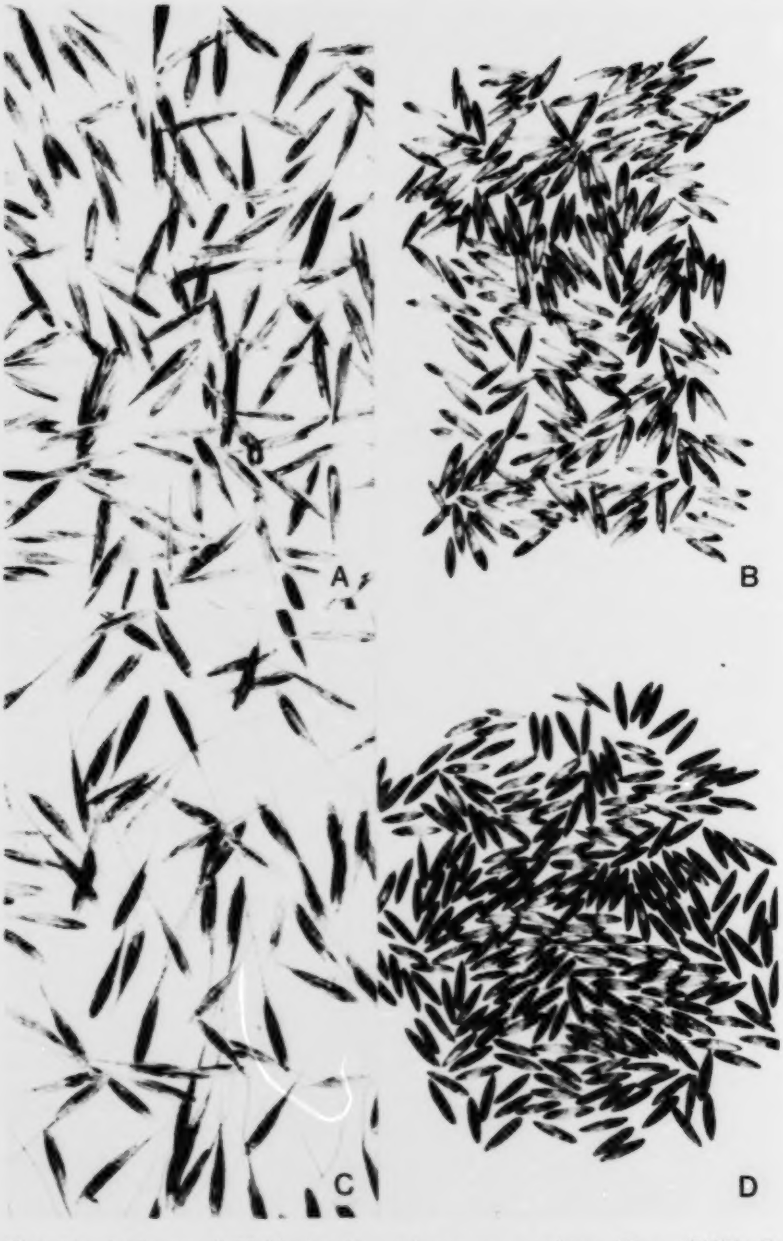


Plate 44. *A*, Florets of ***Muhlenbergia mexicana*** var. *mexicana* (Dore 17489); *B*, Caryopses of *M. mexicana* var. *mexicana* (Dore 17489); *C*, Florets of *M. mexicana* var. *filiformis* (Dore 17556); *D*, Caryopses of *M. mexicana* var. *filiformis* (Dore 17556).

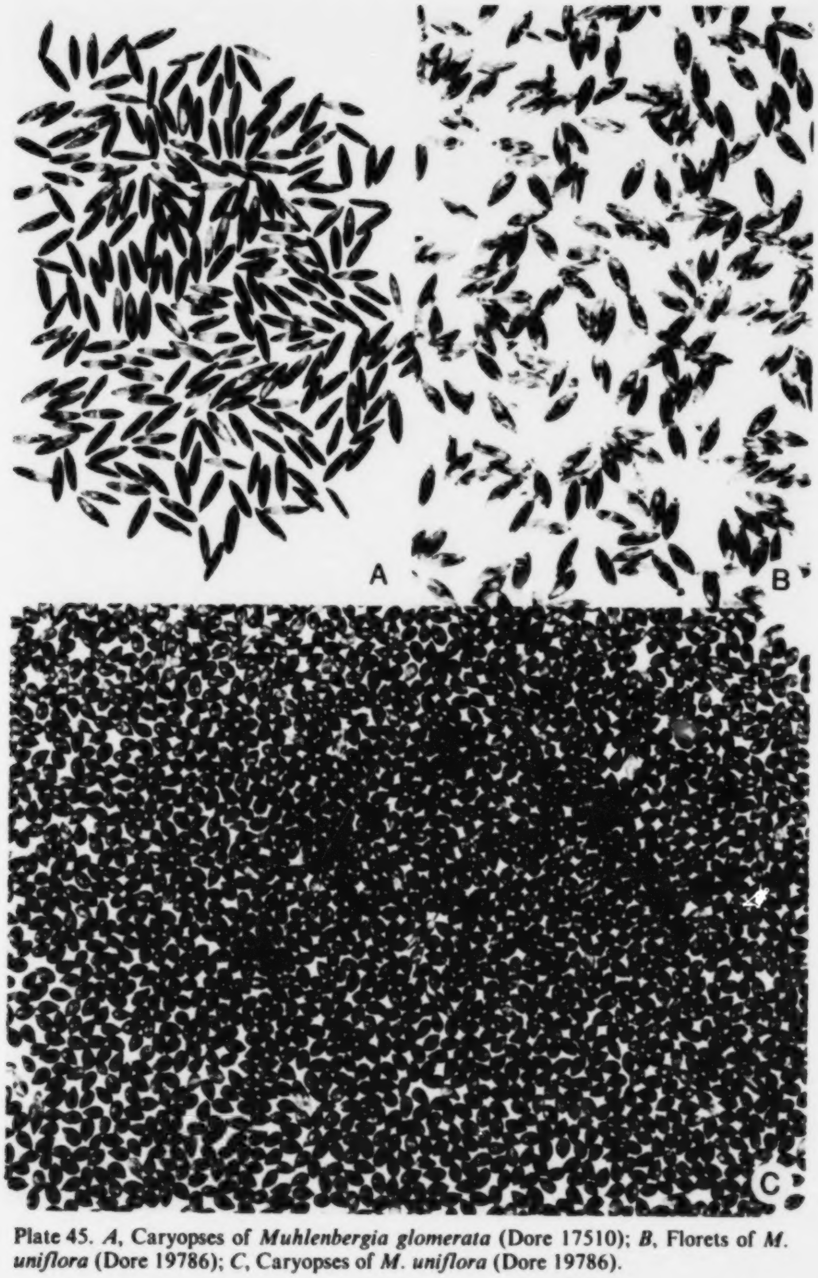


Plate 45. *A*, Caryopses of ***Muhlenbergia glomerata*** (Dore 17510); *B*, Florets of *M. uniflora* (Dore 19786); *C*, Caryopses of *M. uniflora* (Dore 19786).

49. Sporobolus R. Br.

Low to medium-sized annual or perennial grasses. Leaf blades slender, generally firm and inrolled, frequently long-ciliate toward the base, otherwise hairless; ligule a row of short hairs. Panicles delicate with small, 1-flowered spikelets. Glumes and lemma 1-nerved, awnless. Glumes hairless; palea as long as or longer than the lemma, splitting along the back between the veins at maturity. Grain usually with a loose pericarp.

- A. Annuals, less than 40 cm high, becoming conspicuous only in late summer; panicles meager, up to 5 cm long, partially or completely enclosed in the inflated sheaths
  - B. Exserted spikelets 2–3 mm long; lemma hairless, white or usually suffused with pink; palea thin and readily splitting, slightly longer than the lemma, acute, not taper-pointed; grain ovoid, 1–1.8 mm long; pericarp swelling and becoming gelatinous on wetting .... 1. ***S. neglectus***
  - B. Exserted spikelets 3.5–6.5 mm long; lemma white, generally mottled with olive-gray or sometimes dull-colored throughout; palea firm, often not splitting to let out grain, if longer than the lemma, tapering into a slender beak 0.2–1.8 mm long; grain oblong to elliptical, 1.7–3.2 mm long; pericarp not swelling on wetting .... 2. ***S. vaginiflorus***
- A. Perennials, generally more than 50 cm high, commencing growth early in season; panicles ample, more than 5 cm long
  - E. Spikelets 2–2.5 mm long; panicles enclosed within the leaf sheath or the terminal well-exserted; leaf sheaths conspicuously pilose on the collar; pericarp thin .... 3. ***S. cryptandrus***
  - E. Spikelets 4–6 mm long
    - F. Panicles contracted, more or less enclosed within the leaf sheaths; leaf sheaths hairless; upper glume shorter than lemma; palea not exceeding lemma; grain elliptic, brown, with thin pericarp, included within floret .... 4. ***S. asper***
    - F. Panicles expanded, not enclosed; leaf sheaths generally woolly near top; upper glume longer than lemma; palea slightly longer than lemma; grain globose, yellow with hard pericarp, expanding and splitting the palea and spreading the glumes at maturity .... 5. ***S. heterolepis***

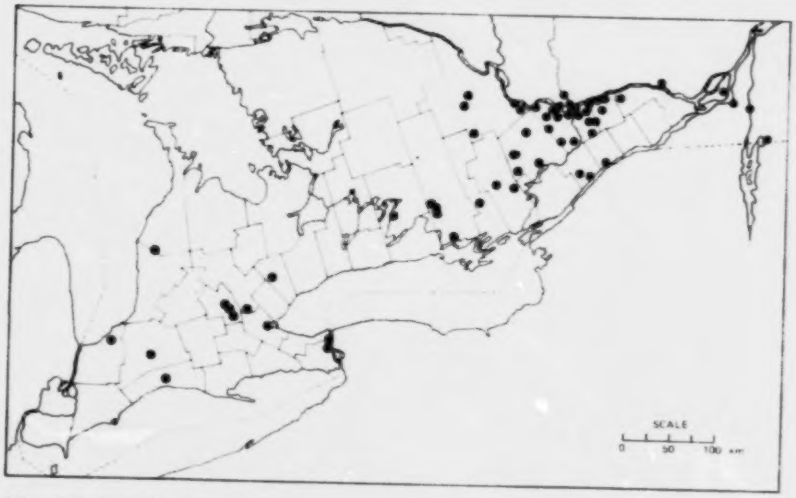
1. *Sporobolus neglectus* Nash

Plate 46, Map 163

overlooked dropseed

A small grass, *Sporobolus neglectus* is common but seldom collected because of its late-season development and its vegetative appearance, even when in flower. Its lateral panicles are completely hidden in the sheaths, but the terminal one sometimes protrudes, particularly in plants that started growth early in the year. Where the panicle is exserted, the spikelets turn a deep pink. Only minute nonfunctional anthers are present, and the plant is apomictic. The asexually produced grains vary considerably in size within a single sheath. The habit of the plant is strongly influenced by crowding, soil conditions, and day length. Plants under a short day length regime remain dwarf but produce seeds rapidly, whereas those under long days continue vegetative growth for several months.

The original habitat of this species seem to have been open ground along the summer-dry flood shores of rivers and lakes or around flat rocky outcrops in woodland, where the shallowness of the soil prevented growth of a dense canopy. With European settlement, however, the species spread rapidly to poor pastureland and roadway shoulders; dispersal is aided by the stickiness of the seed covering when wet. *S. neglectus* probably now occurs across all the southern counties of the province. It is, however, absent from Algonquin Park, the Bruce Peninsula, and areas to the north. The concentration of records in the Ottawa-Carleton region and adjacent counties reflects the more intensive study of the grasses of that area.



Map 163. *Sporobolus neglectus*.

2. *Sporobolus vaginiflorus* (Torrey) A. Wood

Plate 46, Map 164

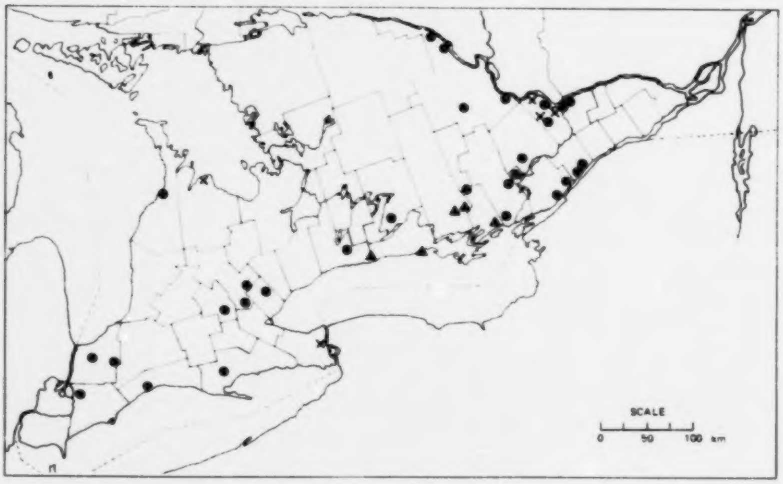
ensheathed dropseed

Sporobolus vaginiflorus is similar in appearance, behavior, and habitat to *S. neglectus*. The two species cannot be distinguished when immature and are even difficult to separate at maturity in the field. Under good conditions *S. vaginiflorus* is taller, growing up to 40 cm in height compared with a maximum size of about 20 cm for *S. neglectus*. Under poor conditions or crowding, plants are very much smaller. Dark purple anthers, 2–3 mm long, with viable pollen, are often produced in the terminal florets.

A. Lemma and palea glabrous, about equal in length; leaf sheaths with a few long hairs .... c. var. ***ozarkanus***
A. Lemma and palea minutely appressed, pubescent, leaf sheaths glabrous
  B. Palea and lemma acute, about equal in length .... a. var. ***vaginiflorus***
  B. Palea prolonged well beyond the lemma, tapering into a slender beak, 0.2–1.8 mm long .... b. var. ***inaequalis***

2a. var. *vaginiflorus*

The typical variety, var. *vaginiflorus*, is rather scarce in Ontario and is known only from a few localities in the Ottawa district, along the Niagara River, and at Johnston Harbour on Georgian Bay.



Map 164. ***Sporobolus vaginiflorus*** **var.** ***vaginiflorus*** **(×), var.** ***inaequalis*** **(•), and var.** ***ozarkanus*** **(▲).**

2b. var. *inaequalis* Fernald

Var. *inaequalis* is the common variant across southern Ontario. It is probably less widely distributed than *S. neglectus* and has not yet been recorded from the five easternmost counties. In some areas it forms dense borders of distinctive green for long stretches along paved highways.

2c. var. *ozarkanus* (Fernald) Shinners (*S. ozarkanus* Fernald)

Five specimens that seem best referred to var. *ozarkanus* have been collected in Ontario, all in one general area between Port Hope and Kingston. The taxon is not otherwise known outside the type locality in the Ozarks at Webb City, Missouri.

The plants have spikelets more than 3 mm long, firm-textured floret scales, and a pericarp that does not swell on wetting, indicating that they are better referred to *S. vaginiflorus* than *S. neglectus* with which they share only the hairless lemmas. Because the lemma is hairless, its faint lateral veins show up better than they do in the other two varieties. The Ontario plants are not quite as pilose in the leaf sheaths and blades as the type specimen from the Ozarks, but more so than in plants of the other varieties of *S. vaginiflorus* and of *S. neglectus*.

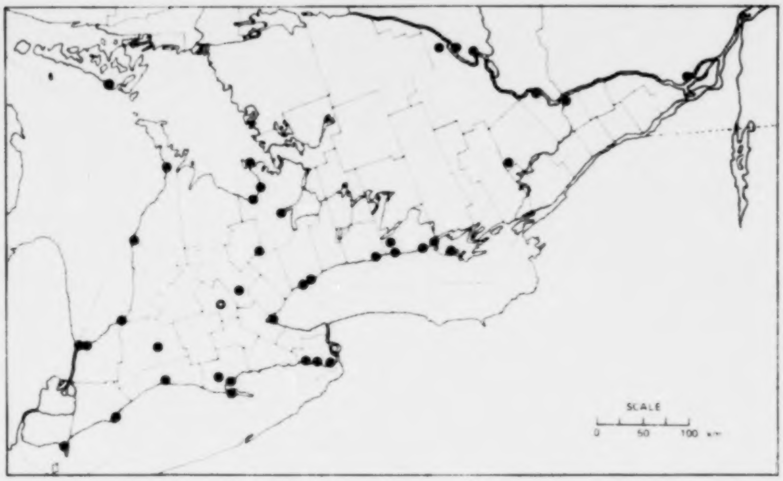
3. *Sporobolus cryptandrus* (Torrey) A. Gray

Plates 46 and 47, Map 165

sand dropseed

Sporobolus cryptandrus is characteristic of dry sand along the beaches of lower Lake Huron, southern Georgian Bay, Lake Erie, and Lake Ontario where it has long been known. It is also found naturally on the sand flats along the upper Ottawa River, at Petawawa and on nearby Allumette Island, and at Sable Island, Lake of the Woods in the far west of the province. Recent records inland from the lakeshores seem to represent introductions; examples include those on railway tracks at London and at Maberly in Lanark County, and on roadsides near Simcoe. The pericarp, which is sticky when wet, probably causes the grains to be carried by vehicles and equipment from place to place in the sand.

In many plants growing on exposed beaches, the panicle remains inside the upper sheath, which becomes elongated, curved, and swollen. Grains produced cleistogamously in such panicles give rise to plants with well-exserted and expanded panicles when grown in good soil. *S. cryptandrus* is claimed to be a good sand binder but in the absence of rhizomes this quality is limited. Plants of the species do, however, establish readily in bare sand from the abundant grains and give a cover that would otherwise be lacking.



Map 165. *Sporobolus cryptandrus*. All known Canadian records from the area covered by the map are plotted.

4. *Sporobolus asper* (Michaux) Kunth

Plate 47, Map 166

Sporobolus asper was recorded by Zenkert (1934) as "rare, dry limestone soil, gorge of river, at Niagara Glen, Ontario 1918 (Johnston)." This is substantiated by a specimen in the New York State Museum Herbarium at Buffalo. The species was rediscovered in this area in 1976 (Reznicek, pers. comm). It has also been found recently south of Windsor in two localities a few kilometres apart: La Salle prairie and Ojibway prairie. Other recent reports suggest that it may be relatively widespread in the extreme southwestern counties of Ontario.

S. asper is also recorded from Nun's Island, Montreal (Rouleau 1954) and is found in the states of New York and Ohio.

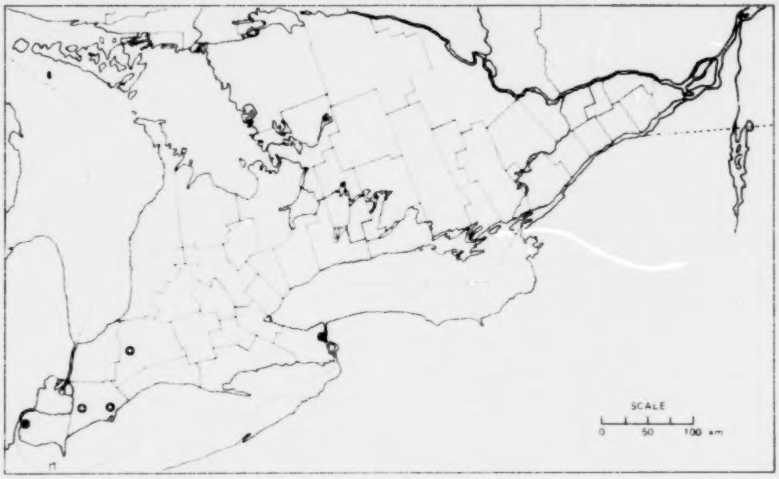
5. *Sporobolus heterolepis* (A. Gray) A. Gray

Plate 48, Map 167

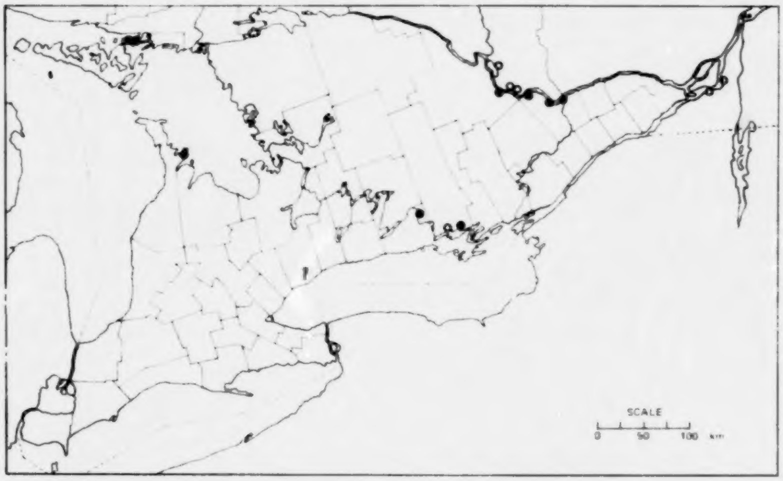
northern dropseed

A characteristic species of tall-grass prairie, *Sporobolus heterolepis* is a very rare grass in Eastern Canada. It is known from a few isolated localities along the Ottawa River between Ottawa and Fort Coulonge, at Montreal, on an island in the Trent River at Healey Falls (1862), at Shannonville in Hastings County (1873), on rocky shores of Georgian Bay at Cape Croker (1905), and in barren prairie on the eastern side of La Cloche Island (1860). The dates are those of the only collections from those sites. In recent years it has been found only in the Ottawa-Carleton area and at Great Cloche Island. It appears to be a prairie relict that is fast disappearing. There seems to be no basis for a report of the species from the Toronto vicinity. The type locality is at nearby Watertown, N.Y.

Crypsis schoenoides **(L.) Lam. (*Heleochloa schoenoides* (L.) Host)**— This species has recently been discovered in Ontario in alkaline soil south of the Windsor Salt Factory in the city of Windsor (Catling et al. 1978). This is also the first report of the species in Canada. It resembles *Sporobolus* in its loose pericarp but is readily distinguished by its short spicate panicles. Current taxonomic treatments (Hubbard 1947, Lorch 1962) unite *Heleochloa* with *Crypsis*.



Map 166. *Sporobolus asper.*



Map 167. *Sporobolus heterolepis.* Literature reports and other records not substantiated by a specimen are indicated by an open circle (○). One report that seems to be without basis is marked with a question mark (?). All known Canadian records from the area covered by the map are plotted.

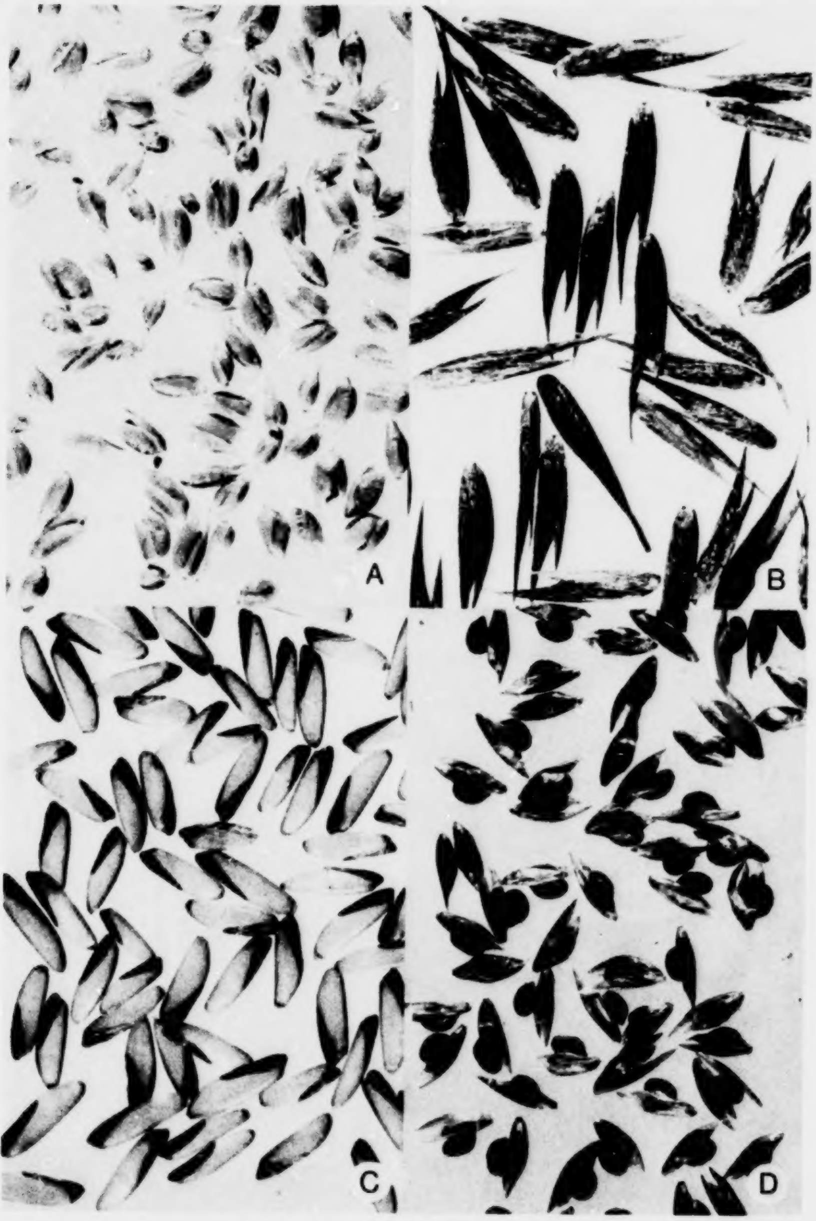


Plate 46. *A*, Various sizes of cleistogamous florets of *Sporobolus neglectus* (Dore and Gillett 17511); *B*, Florets of *S. vaginiflorus* var. *inaequalis* (Dore and Gillett 17581); *C*, Caryopses of *S. vaginiflorus* var. *inaequalis* (Dore and Gillett 17581); *D*, Florets of *S. cryptandrus* with extruding seeds (Dore 17598).

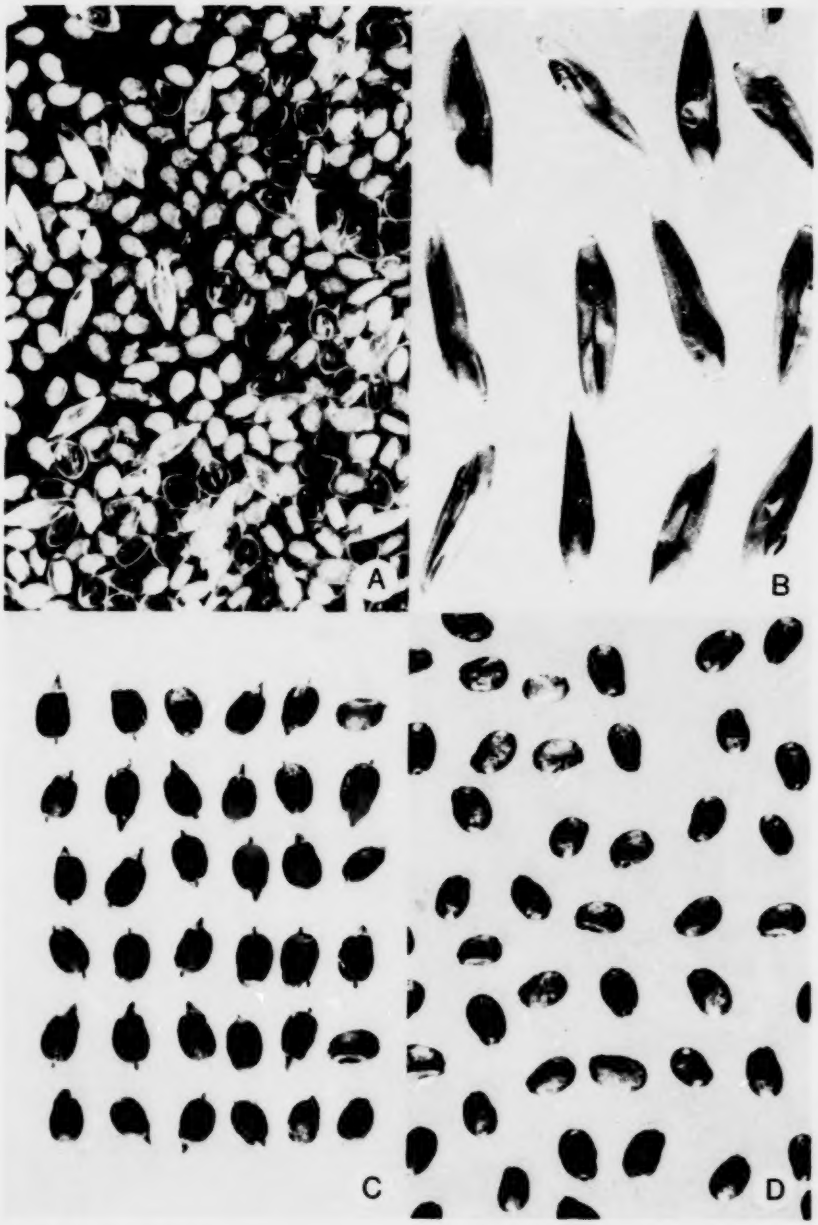


Plate 47. *A*, Gelatinous pericarps and seeds of *Sporobolus cryptandrus* (Dore 17598); *B*, Florets of *S. asper* (Dore 25012); *C*, Caryopses of *S. asper* (Dore 25012); *D*, Seeds of *S. asper* (Dore 25012).

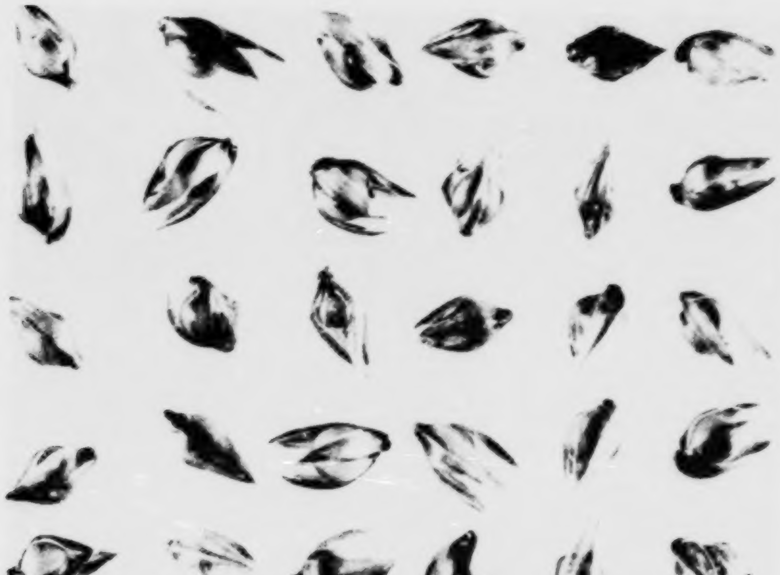


Plate 48. *A*, Florets of *Sporobolus heterolepis* (Dore 24894); *B*, Caryopses of *S. heterolepis* (Dore 24894).

50. Brachyelytrum Beauv.

Thin and brittle-culmed perennials, generally growing from short rhizomes that retain the spriggy bases of old culms. Leaf blades pilose (especially beneath), borne mainly on the lower half of the culm; ligule membranous, 1–2 mm long. Panicle few-spikeleted, slender, contracted, somewhat nodding. Spikelets 1-flowered, breaking away while still green and leaving the minute unequal glumes on short but slender pedicels. Lemma long-awned, tightly enclosing the palea; rachilla extending beyond the floret as a bristle about the length of the body of the lemma.

1. *Brachyelytrum erectum* (Schreber) Beauv.

Plate 49, Maps 168 and 169

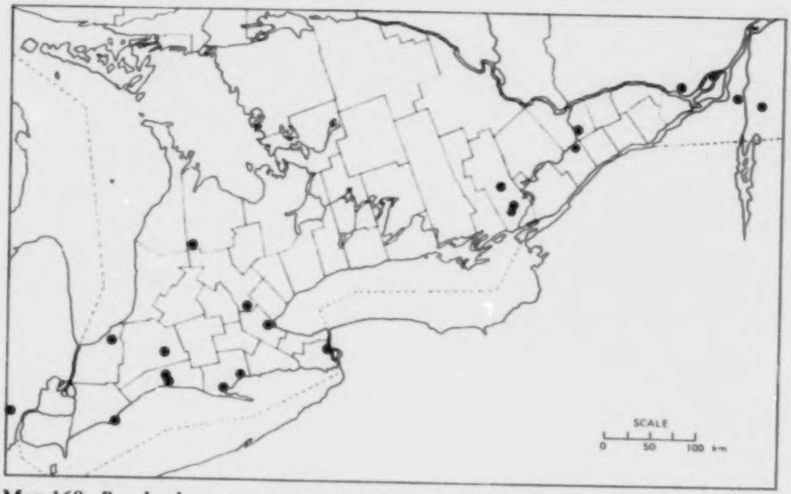
bearded shorthusk

Lemma conspicuously nerved, 11.5–13 mm long, hispid with glistening setae 0.2–0.5 mm long .... a. var. ***erectum***
Lemma weakly nerved, 8.5–10 mm long, glabrous or hispidulous ... b. var. ***glabratum***

1a. var. *erectum*

The typical variety, *Brachyelytrum erectum* var. *erectum*, is the predominant one southward in the United States, but in Canada it occurs only in southern Ontario and in nearby Quebec. In the southwestern counties, it is found in mesic hardwoods such as at Rondeau, Kent County, St. Thomas, Port Rowan, Regional Municipality of Haldimand-Norfolk, Hamilton, Aberfoyle, Wellington County, and Ayton, Grey County. At some of its longer-known localities, such as Niagara and London, it is probably now extinct. There are also a few records from the eastern counties and from around Montreal.

Compared with the more common var. *glabratum*, plants of var. *erectum* are distinctive in the field by their coarser growth, darker green and broader leaf blades, more prominently veined lemmas, and longer upper glumes. This variety also appears to inhabit richer woodland on warm soils in contrast to the moist boreal woods of which var. *glabratum* is characteristic.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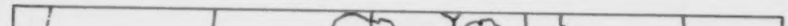
Map 168. *Brachyelytrum erectum* var. *erectum*. All known Canadian records from the area covered by the map are plotted.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Map 169. *Brachyelytrum erectum* var. *glabratum*. All known Canadian records from the area covered by the map are plotted.

Plants from Sharbot Lake in Frontenac County and Manotick Station in the Ottawa-Carleton area have the somatic chromosome number $2n = 22$ (Bowden 1960*a*).

1b. var. *glabratum* (Vasey ex Millsp.) T. Koyama & Kawano (var. *septentrionale* Babel)

Var. *glabratum* is widespread across Eastern Canada from Newfoundland and Nova Scotia to Lake Superior; in eastern Ontario it is particularly common in rocky or sandy woodlands, usually forming conspicuous yellow green stands. It is prevalent as far north as Temagami in the Nipissing District, but is found farther north in western Quebec. It occurs westward to the eastern edge of Lake Superior and around Macdiarmid by Lake Nipigon. There is an unsubstantiated record from Thunder Bay in Macoun's *Catalogue* (1888). The grass is not known in Manitoulin Island, the Bruce Peninsula, or much of southwestern Ontario; old records from Owen Sound, "Moon River" and Lambton County are probably erroneous.

The somatic chromosome number $2n = 22$ has been determined on a plant from McLean, Frontenac County (Bowden 1960*a*).

51. Milium L.

Tall perennial grasses with smooth fragile stems. Foliage hairless; blades wide, rather blunt, glaucous green; ligule long, membranous. Panicles terminal, loose; branches often in pairs, widely spreading or reflexed, bearing few spikelets near their ends. Spikelets 1-flowered. Glumes rounded and somewhat flattened on the back, pale green but turning yellowish at maturity. Lemma smooth and shiny, firm and hard, awnless, its edges overlapping the palea and enclosing the grain, much as in *Panicum*.

1. *Milium effusum* L.

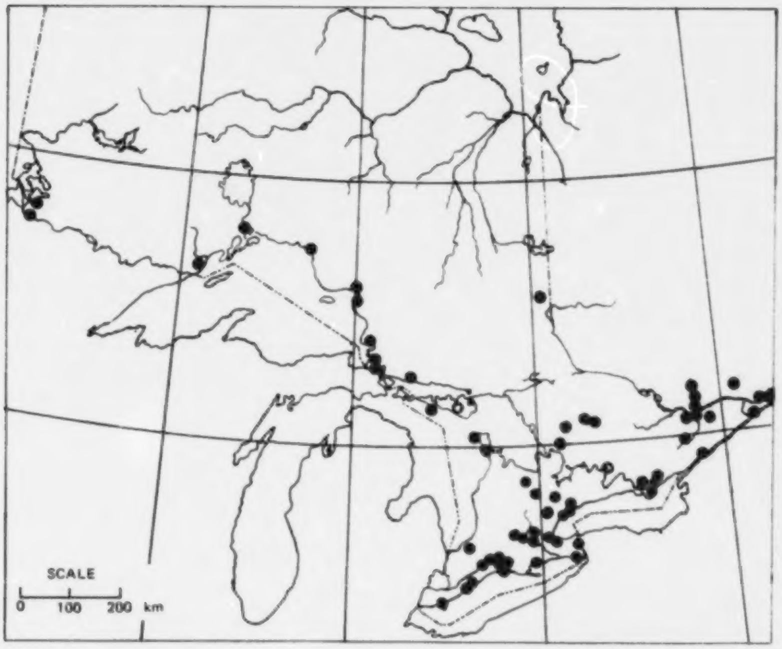
Plate 49, Map 170

wood millet

A striking plant of deciduous woodlands, *Milium effusum* is found across the southern part of the province from the lower Ottawa Valley to Algonquin Park and the Bruce Peninsula. Its occurrence in nature is rather sporadic, and dense and continuous stands are seldom found. There are extensive areas in the central counties of southern Ontario where the species has never been collected, yet where conditions would appear favorable for its growth. These include the Madawaska Highlands and Renfrew County, the terrain of the Trent River System to Simcoe County, as well as much of the upland in Perth, Huron, Bruce, and Grey counties. Local abundance has diminished during the past decades with the clearing and grazing of the land. The occurrence of the species in limestone woods to the north of New Liskeard (Baldwin 1958) represents a far outlying station.

To the west, the grass occurs in alluvial woodland along the Mississagi River near the Lake Huron shore, in deciduous woodland at Sault Ste. Marie, and at a few other points widely spaced along the Lake Superior shore. It has not been refound at Nipigon since its first collection in 1884, nor at Mount McKay near Thunder Bay since 1912. It was, however, detected in 1961 in rich woodland in the vicinity of Rainy River, the only recent record for northwestern Ontario.

The species also occurs in northern Europe; the North American plants have been distinguished at varietal rank as var. *cisatlanticum* Fernald. They



Map 170. ***Milium effusum***. All known Canadian records from the area covered by the map are plotted.

differ in being somewhat taller, with wider, smoother, usually glaucous leaf blades, fewer panicle branches per node, and slightly larger spikelets. The extent to which these characters are consistent is not clear and further study is needed on the differences and similarities of these vicariant populations. A plant from Navan, Regional Municipality of Ottawa-Carleton, has the somatic chromosome number $2n = 28$. (Bowden 1960*b*), the same as that reported for plants from Europe.

The soft, leafy, and somewhat succulent, rich growth, as well as its early maturity, might make wood millet a possible forage plant. It is certainly an attractive grass that might be ornamental in cultivation. The smooth fruit separates out readily at maturity.

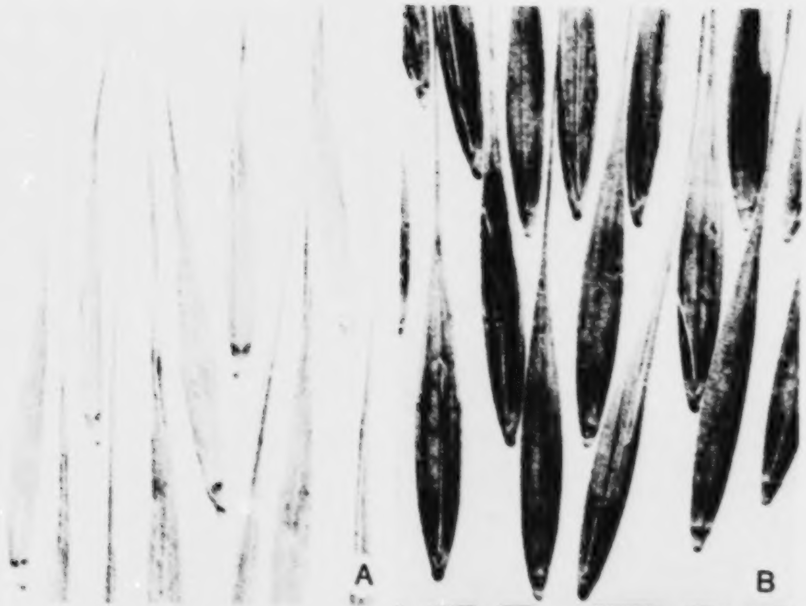


Plate 49. *A*, Florets of ***Brachyelytrum erectum*** var. ***erectum*** (Dore 22165); *B*, Florets of *B. erectum* var. *glabratum* (Dore 21117); *C*, Caryopses of *B. erectum* var. *glabratum* (Dore 18458); *D*, Florets of *Milium effusum* (Dore 24531).

52. Oryzopsis Michaux

Native tufted perennials. Leaf sheaths and lower sides of blades hairless; blades firm, deeply ridged above, often involute or inrolling rapidly on drying; ligule membranous, short. Panicles sparsely spikeleted; spikelets 1-flowered. Glumes broad-lanceolate, almost equal in length, covering the body of the floret. Lemma firm and hard, rolled around the palea and grain, appressed pubescent, awned from the tip; awn deciduous, sometimes falling off before flowering.

A. Lemmas (exclusive of awns) 6–9 mm long; leaf blades flat but margins rolling in somewhat on drying, more than 4 mm wide
  B. Leaf blades mainly basal, scabrous and glaucous above; culm leaves with greatly reduced blades; lemma white, pale yellow or straw-colored at maturity .... 1. ***O. asperifolia***
  B. Leaf blades mainly cauline, short-pilose above; basal leaves with short blades; lemma yellow-brown, turning black at maturity .... 2. ***O. racemosa***
A. Lemmas (exclusive of awns) 2–4 mm long; leaf blades involute, less than 3 mm diam, mainly basal
  C. Awn of lemma less than 2 mm long, straight, falling off at flowering time or before; callus of lemma smooth, shiny, yellowish, blunt, 0.2 mm long; culms usually less than 40 cm high .... 3. ***O. pungens***
  C. Awn of lemma about 10 mm long, flexuous, twisted, persisting almost to maturity; callus of lemma dull, pale green or white, acute, less than 0.1 mm long; culms usually more than 50 cm high .... 4. ***O. canadensis***

1. *Oryzopsis asperifolia* Michaux

Plate 50, Map 171

rough-leaved mountain-rice, winter grass

One of the earliest of our native grasses to flower, *Oryzopsis asperifolia* blooms in April and early May in southern Ontario, but somewhat later in the north. The tufts of long dark green blades that surround the sprawling culms at flowering time are those of the previous season. New leaves develop in midsummer when the old ones are beginning to die from the tip downward. Winter grass is probably our only species that has a truly wintergreen habit. Other grasses that stay green until spring have leaves that rot soon after they escape from the freezing conditions of winter.

In its woodland habitat, *O. asperifolia* can make considerable growth in spring before the tree canopy cuts off the sunlight. The lower part of the leaf sheaths below the surface mold is usually bright purple, although white forms are often encountered. In the field, careful observation is needed to determine which side of the blade is morphologically the upper (adaxial) surface (*see* Voss 1961).

An observation made by Frederick Pursh in 1814 regarding *O. asperifolia*, which would apply also to *O. racemosa*, seems never to have been taken up: "I consider it worthy of the attention of farmers as the considerable large seeds contain the finest flour of any grain I know" (Fl. Amer. Sept. 1:60). The reason has undoubtedly been that it is difficult to grow this weakly rooted grass in soil lacking a surface mulch; but a good crop can often be gathered from wild stands.

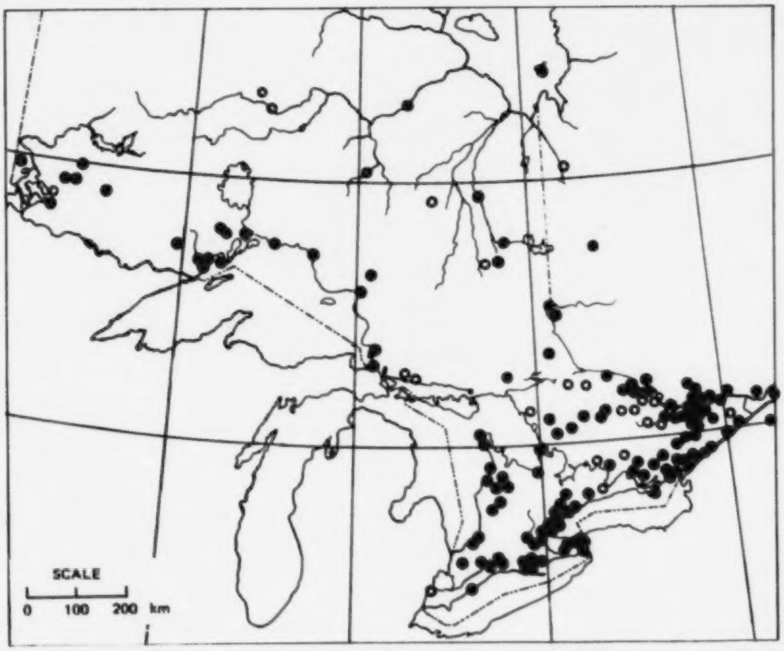
The species is rather common in dry woods across southern Ontario especially in acid soil regions, but it is not as abundant in the southwestern counties as the numerous specimens, collected as rarities, would seem to indicate. No specimens have been seen from Essex County and Dodge's (1914) record for Windsor has not been substantiated. On the other hand, the few collections from the Clay Belt and northwestern Ontario state that the species is common or frequent. No specimens are known from Manitoulin Island, from a large tract north of Lake Huron, or from the far north. Because the species has large seeds and is confined to dry soil, its migration would be seriously interrupted by large expanses of water or wetland.

2. *Oryzopsis racemosa* (Sm.) Ricker

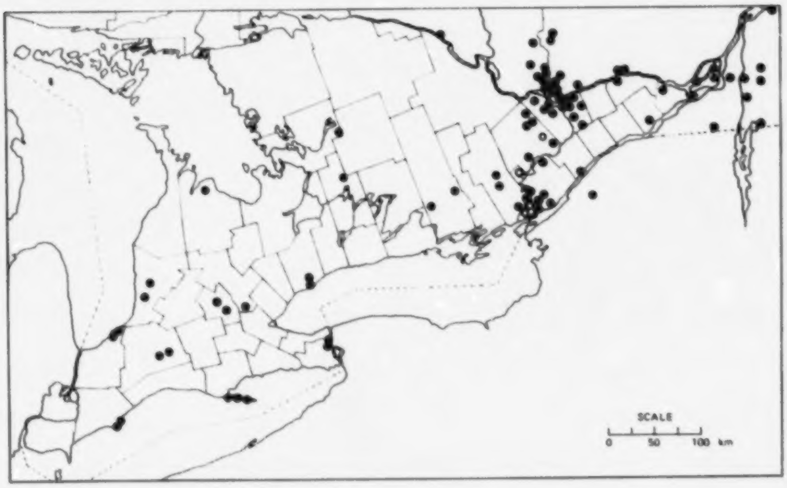
Plate 50, Map 172

mountain-rice

A tall attractive species with upright leafy culms and wide-spreading panicle branches, *Oryzopsis racemosa* flowers in late July and August and fruits in September. It is characteristic of rich deciduous woods, especially on shallow limestone soils. In southeastern Ontario, the occurrence of this species makes a pattern suggesting an invasion during a recessional stage of the Champlain Sea, at which time it probably reached the Monteregian Hills, then islands, in adjoining Quebec. In southern Ontario it is found in dry sandy woods near the shore at Toronto, Niagara, Long Point, Rondeau, and Grand Bend but has not been collected at other well-explored areas, such as Hamilton, Point Abino, and the shores of the Bruce Peninsula. Inland it is very scarce and only found scattered in some rich deciduous forests.



Map 171. *Oryzopsis asperifolia*. All known Canadian records from the area covered by the map are plotted.



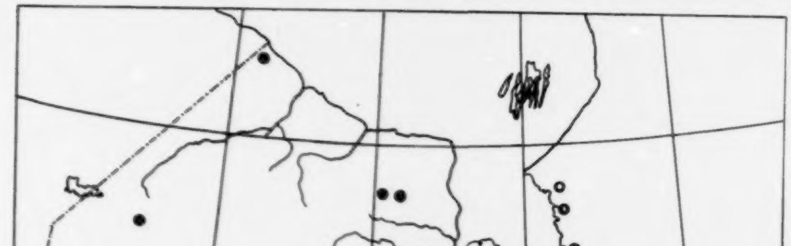
Map 172. *Oryzopsis racemosa*. All known Canadian records from the area covered by the map are plotted.

3. *Oryzopsis pungens* (Torrey) A.S. Hitchc.

Plate 51, Map 173

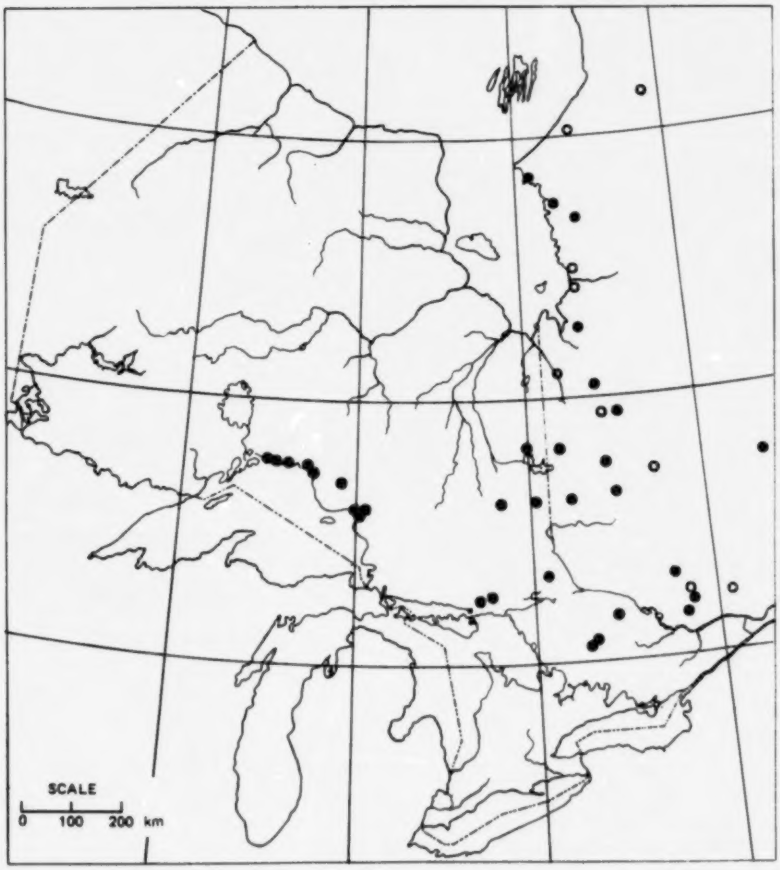
sharp-leaved oryzopsis

A characteristic, densely tufted, fine-leaved grass of dry open pine woods, *Oryzopsis pungens* is found on acidic rocks of the Precambrian Shield, northward from the Frontenac Axis to the east side of James Bay. It has not, however, been found on the Ontario side. In the upper Ottawa Valley, it is common on sand plains from the Ottawa-Carleton area and



Map 173. *Oryzopsis pungens*. All known Canadian records from the area covered by the map are plotted.

Renfrew County to Lake Nipissing. In the Lake Superior and northwestern areas of the province it is abundant on the jack pine barrens, especially after burns. It is somewhat localized on the old sand dunes along the Lake Huron shore at the Pinery near Port Franks, Lambton County, the western Bruce Peninsula, Manitoulin Island, and in some sandy areas from Cambridge to London away from the lakes. Otherwise, it is lacking in most of southern Ontario. The species, which ranges across Canada, is abundant on the prairies.



Map 174. ***Oryzopsis canadensis***. All known Canadian records from the area covered by the map are plotted.

4. *Oryzopsis canadensis* (Poiret) Torrey

Plate 51, Map 174

Canada oryzopsis

Oryzopsis canadensis is a species of wide northern distribution. Before the 1930s it was known in Ontario only from collections by Macoun made at Michipicoten in 1869 and at "Long Portage, Petawawa River" in 1900. It is now known at numerous points along the Lake Superior shore between Schreiber and Brule Bay, and at a few places from Espanola, Sudbury Region, to around Lake Abitibi, Cochrane District.

Most of the localities mentioned under *O. canadensis* in Macoun's *Catalogue* (1888) refer to *O. pungens*; those under *Stipa richardsonii*, however, refer to *O. canadensis* (*see* Scribner in Macoun 1890, p. 390). The report for Waterloo County (Montgomery 1945) is based on a Herriot specimen of *O. pungens*. A specimen labeled "*O. canadensis*" from High Park, Toronto, collected in 1890 is also of that species.

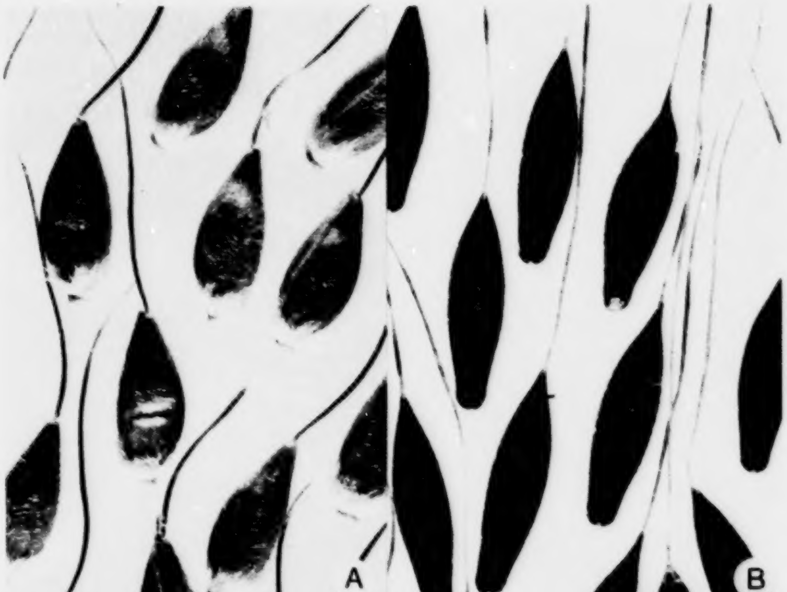


Plate 50. *A*, Florets of *Oryzopsis asperifolia* (Dore 21335); *B*, Florets of *O. racemosa* with awns (Dore in 1969); *C*, Florets of *O. racemosa* after shedding awns (Dore 21904); *D*, Caryopses of *O. racemosa* (Dore 21904).

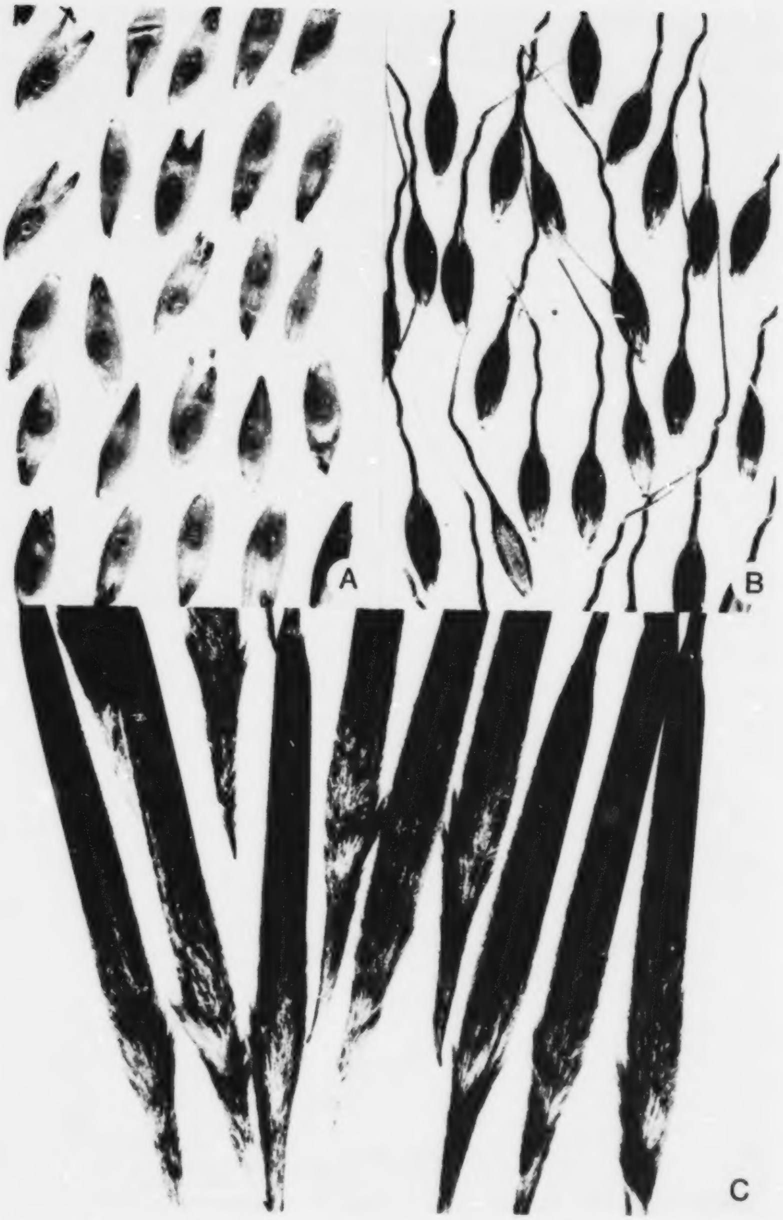


Plate 51. *A*, Florets of *Oryzopsis pungens* (Dore and Wilson 23915); *B*, Florets of *O. canadensis* (Dore 21252); *C*, Florets of *Stipa spartea* (Dore and Marchant 24162).

53. Stipa L.

Large perennial grasses, lacking rhizomes. Leaf blades long-tapering, involute; ligule short, hard. Panicle large, few-flowered, contracted, arching. Spikelets 1-flowered, on long branches. Glumes papery, pale, attenuate, longer than body of lemma. Lemma hard, with sharp bristly callus and stout twisted awn 5–20 cm long.

A. Glumes about 1 cm long; lemma body 0.8–1 cm long, hairless, papillate, dark brown with slender awn less than 10 cm long .... 2. ***S. avenacea***
A. Glumes 1.5–4 cm long: lemma body 1–2 cm long, appressed, pubescent; lemma awn 10–20 cm long
  B. Glumes 2.5–4 cm long; lemma body 1.5–2 cm long, light brown; callus about 7 mm long; awn coarse, 12–20 cm long; plants about 100 cm high; expanded blades 3–5 mm broad .... 1. ***S. spartea***
  B. Glumes 1.5–2 cm long; lemma body 1–1.3 cm long, whitish or straw-colored; callus about 3 mm long; awn more slender, 10–15 cm long; plants 30–60 cm high; expanded blades 1–2 mm wide .... ***S. comata*** (p. 363)

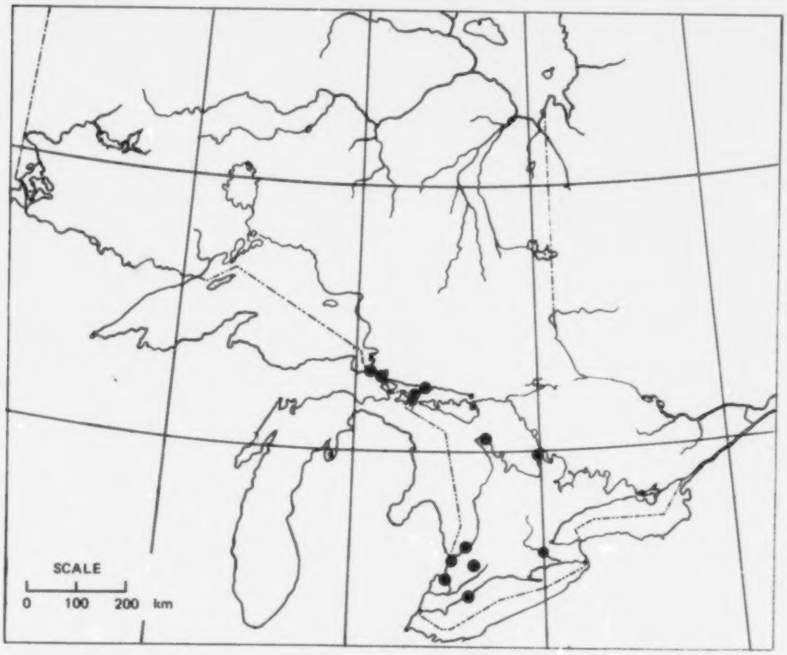
1. *Stipa spartea* Trin.

Plate 51, Map 175

porcupine grass

Stipa spartea is rather abundant in the sands along or near the shore of Lake Erie at Rondeau Park, along the shore of Lake Huron at Port Franks, and formerly at Sarnia. Other records are more localized as at Dunks Bay at the tip of the Bruce Peninsula, Beckwith Island in Georgian Bay, Algoma, and near Sault Ste. Marie. Single collections have been made away from the lakeshores at Strathroy in Middlesex County and at Brantford.

Consideration of all locations and dates available throws some doubt on the assumption that *S. spartea* was present in Ontario before European settlement. Macoun's *Catalogue* (1888) records it only for western Canada. The present-day stations in Ontario are widely scattered, separated by terrain that apparently has suitable habitats yet in which this conspicuous grass is absent. Places with such habitats include Point Pelee, Long Point, Sauble Beach, and Wasaga. The possibility of chance or intentional introduction by man, therefore, seems plausible. The Strathroy and Brantford specimens are from roadsides, and the specimens from Algoma are from either the railroad or the sandy shore adjacent to the tracks.



Map 175. *Stipa spartea*. All known Canadian records from the area covered by the map are plotted.

There is, however, an old published record of "*Stipa avenacea*, sandy open pine woods, Pointe aux Pins, eight miles above Sault Ste. Marie, 1869, Macoun." This record was long held to be suspect either as to identity or locality. It is now known to be connected with a specimen at McGill University, which is of *S. spartea*. The species was abundant at the site in 1964, but confined to a small area by the lighthouse on a sandspit in the St. Mary River, a well known stopping place in the past for "les voyageurs" from the West. Another early record dating from 1866 is a collection by John Bell from Mississagi Island, situated in the North Channel of Lake Huron, where Indian parties and early canoe travelers stopped.

The unusual "animated" fruits of *S. spartea* no doubt were as attractive to the native peoples and early explorers as they are to naturalists and school children today. Such seeds, presumably from the Prairies, even found their way into the album of "Grasses from Stony Lake" prepared by the 92-year-old Mrs. Traill in Peterborough County (Dore 1966).

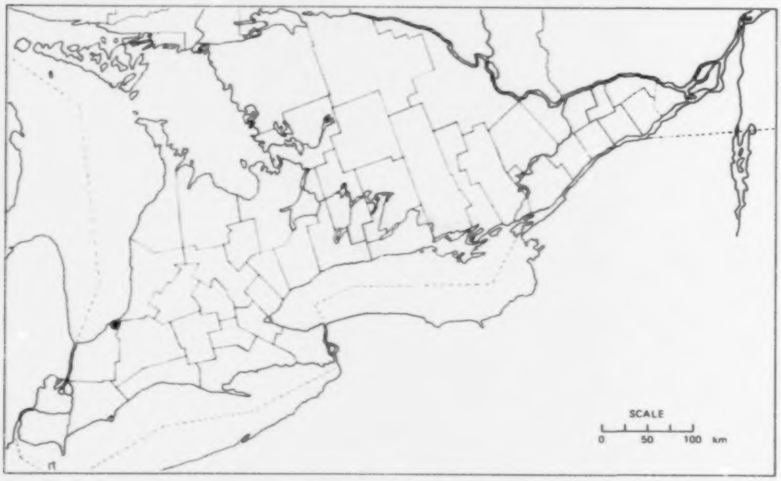
***Stipa comata* Trin. & Rupr.**—This species, known as needle-and-thread, is reported for Lambton County by Dodge (1915) as "plentiful on dryish ground on Squirrel Island probably from the West." This is the basis of the "adv. e. to e. Ont." in *Gray's Manual of Botany* (Fernald 1950), but it rests on a misidentified specimen of *S. spartea* (see Gaiser and Moore 1966).

2. *Stipa avenacea* L. (*Piptochaetium avenaceum* (L.) Parodi)

Map 176

black-seed needle-grass

A specimen of *Stipa avenacea* was collected at the Pinery Provincial Park, Lambton County, in 1965. It is likely that this finding represents a recent colonization. Recent treatments include this species in the predominantly South American genus *Piptochaetium* (cf. Barkworth *in press*).



Map 176. *Stipa avenacea.*

54. Aristida L.

Low-growing slender annuals or weak perennials. Leaf blades narrow (about 1.5 mm wide), hirtellous above, otherwise hairless; ligule a row of dense short hairs about 0.3 mm long. Panicles narrow. Spikelets 1-flowered. Glumes narrow, slenderly tapering to a sharp awn tip, 7–12 mm long. Lemma firm, very slender, scabrous, short-bearded at callus, terminated by a 3-branched awn.

- A. Lateral segments of the lemma awn erect, 0.5–3 (–5) mm long; lemma 4–6 mm long; glumes 5–8 mm long
  - B. Central segment of lemma awn spirally twisted at base, 3–6 mm long; lateral segments all very short, less than 1 mm long; lower glume 6–8 mm long .... 2. ***A. dichotoma***
  - B. Central segment of lemma awn bent but not spirally twisted, 5–10 mm long; at least some lateral segments 1.5–3 (–5) mm long; lower glumes about 5 mm long .... 4. ***A. longespica***
- A. Lateral segment of the lemma awn divergent, 5–70 mm long; lemma 7–20 mm long; glume 7–30 mm long
  - C. Glumes markedly unequal, the upper 12–15 mm long, one-third longer than the lower; central segment of the lemma awn becoming spirally twisted at base; lateral segments one-half to two-thirds as long as central segment .... 1. ***A. basiramea***
  - C. Glumes subequal or occasionally the lower distinctly longer than the upper; central segment of the lemma awn curved or bent but not becoming twisted at base; lateral segments about as long as central segment
    - D. Glumes 20–30 mm long; lemma about 20 mm long; awn segments 40–70 mm long .... 3. ***A. oligantha***
    - D. Glumes 7–12 mm long; lemma 7–8 mm long; awn segments 15–25 mm long
      - E. Annual, without winter buds and with roots decaying in autumn; upper glume equaling or slightly longer than lower glume (length ratio 1.0–1.3) .... 5. ***A. necopina***
      - E. Perennial, with sharp winter buds and tough fibrous roots in autumn; upper glume usually shorter than lower glume (length ratio 0.7–1.0) .... 6. ***A. purpurascens***

1. *Aristida basiramea* Engelm. ex Vasey

Map 177

three-awn

For a time only one collection of *Aristida basiramea* was known from Ontario, from Long Point, Norfolk County. The collection was made in September 1954 by J. E. Cruise and is reported by him, under the name *A. intermedia* (Cruise 1969). A number of plants of *A. basiramea* were growing in close proximity on the dry sand of the beach; these may have represented an introduction of only a few years earlier. The species is often found in sandy land in the United States immediately south of Lake Erie, and its grains may have been transported to the lighthouse tip by some of the many visitors landing there by boat.

In 1975 the species was collected by A. A. Reznicek in a sandy barren area northwest of Penetang in Simcoe County. This seems likely to be a natural occurrence and like other species of *Aristida, A. basiramea* may occur more widely in Ontario than was at one time thought.

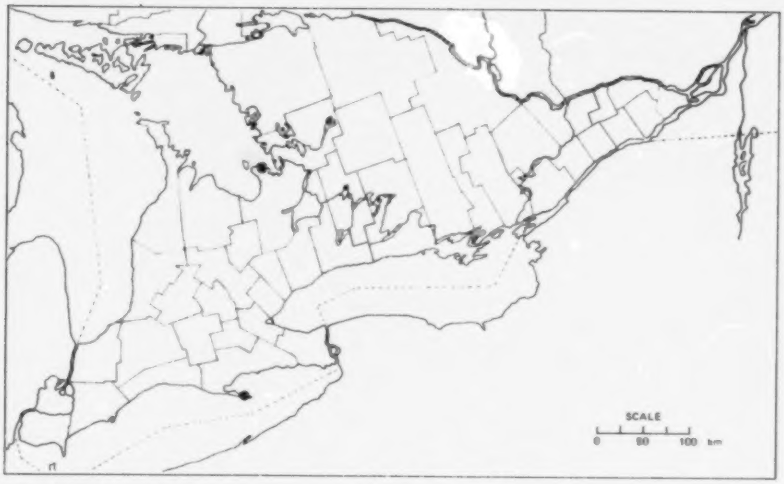
2. *Aristida dichotoma* L.

Map 178

poverty grass, churchmouse three-awn

Previously known in Ontario only from an ambiguous record, *Aristida dichotoma* was found in 1976 in the cinder and gravel of a railway yard about 1 km west of Fort Erie North in the Niagara region (Catling et al. 1978).

The ambiguous record appears in Macoun's *Catalogue* (1888): "Port Colborne. (McGill Coll. Herb.). We have seen no Canadian specimens." This report is supported by a specimen labeled as having been collected by J. C. McRae in 1880. Zenkert (1934) does not record the species in his *Niagara Region Flora*, so if it did occur at Port Colborne, it must have been very rare or did not survive or spread. The recent discovery of *A. dichotoma* elsewhere in the Niagara region increases the probability of the record being correct, but other McRae collections said to be from Port Colborne are almost certainly mislabeled; for example, that of *Fuirena pumila*, a sedge of the southern United States.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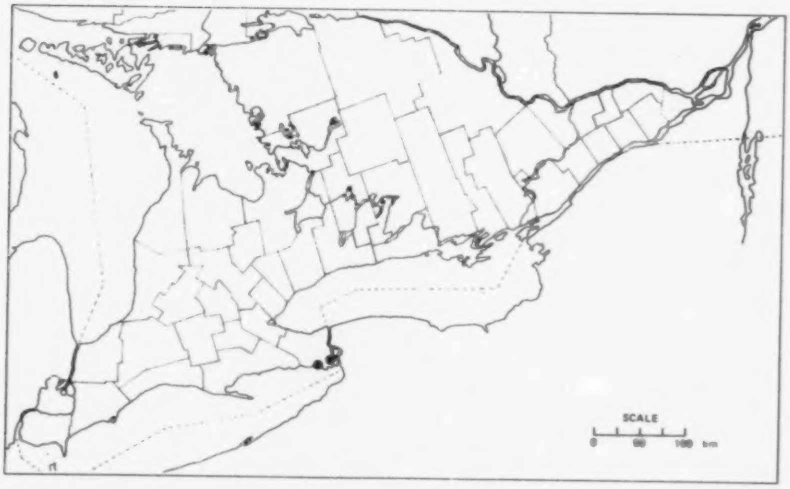
Map 177. *Aristida basiramea.*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Map 178. *Aristida dichotoma.*

3. *Aristida oligantha* Michaux

Map 179

prairie three-awn

An annual grass of open dry ground throughout much of the United States, *Aristida oligantha* was recently discovered for the first time in Canada growing among cinder and gravel in a railway yard west of Fort Erie North in the Niagara region (Catling et al. 1978). The species was found with a number of other presumed adventives, including *Aristida dichotoma, Setaria faberi*, and *Andropogon virginicus*.

4. *Aristida longespica* Poiret

Map 180

A slender annual species, *Aristida longespica* was first discovered in Canada in 1976 in open sandy soil near Thamesville in Kent County. The species was hitherto known only in the eastern United States extending northward to two locations in southeastern Michigan adjacent to Ontario (Voss 1972*b*). An earlier report from Ontario was based on a specimen of the following species, *A. necopina*.

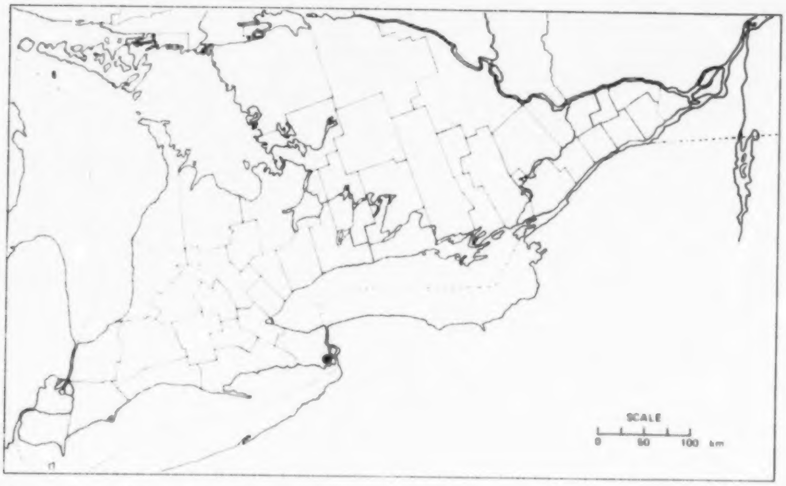
The habitat of the Thamesville collection suggests that this is a native occurrence. The species was growing in association with *A. necopina* (Catling et al. 1978).

5. *Aristida necopina* Shinners (*A. intermedia* auct.)

Map 181

three-awn

Three collections of *Aristida necopina* are known from Ontario. The first was made at Long Point, Norfolk County, where it was found by Marie-Victorin in bare sand in August 1932. These specimens were originally identified as *A. gracilis* Elliott, a synonym of *A. longespica*, a species known in the adjacent United States and only recently discovered in Ontario. The other two collections of *A. necopina* were made in 1976 north of Thamesville in Kent County (Catling et al. 1978).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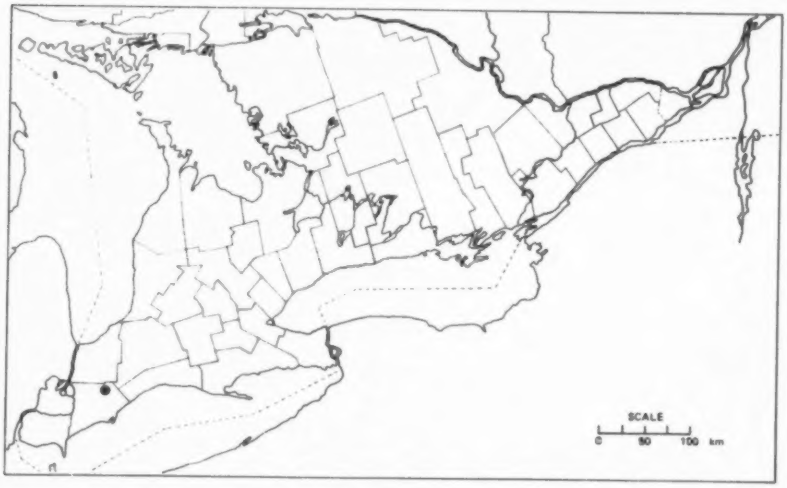
Map 179. *Aristida oligantha.*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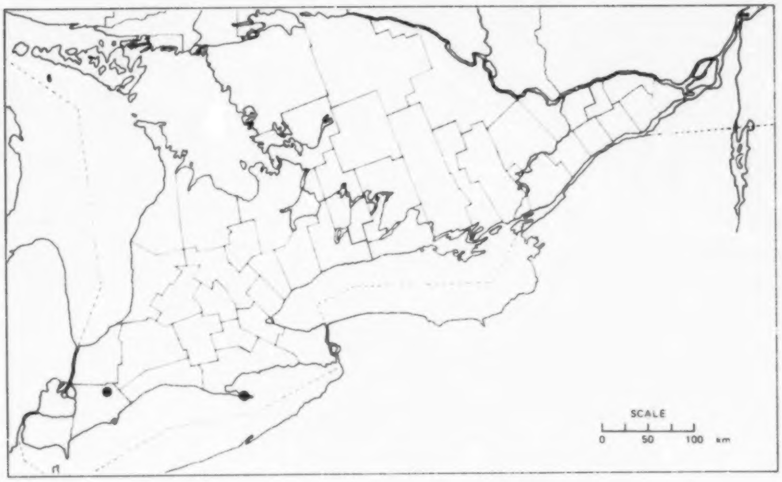
Map 180. *Aristida longespica.*



Map 181. *Aristida purpurascens.*

The occurrence of *A. necopina* at Long Point, where there are many vacationers arriving by boat, probably represents a sporadic introduction. *Aristida* is not mentioned for the area by Landon (1960), but this species is known to be spreading on sandy land in the north central United States. On the other hand, the Thamesville locality on dry sandy soil in an open meadow appears to represent a natural occurrence.

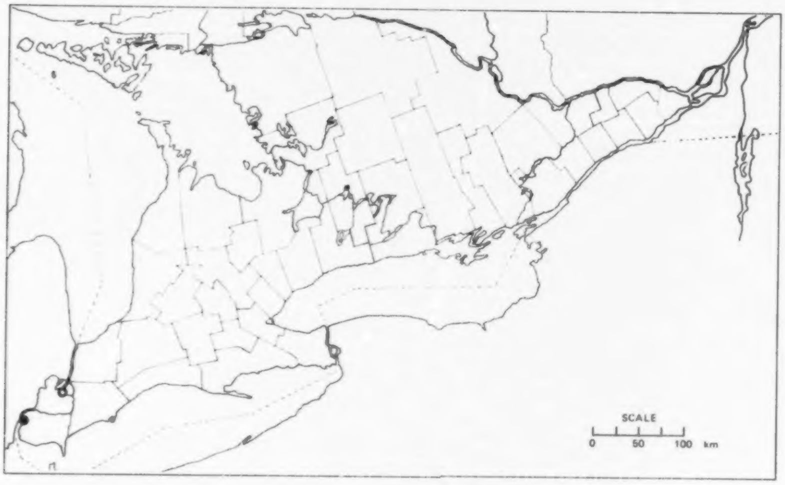
A. intermedia Scribner & C.R. Ball is the name generally used for this species, but according to Shinners (1954, p. 30) its type is referable to *A. longespica*; accordingly he proposed the new name, *A. necopina*.

6. *Aristida purpurascens* Poiret

Map 182

arrow feather three-awn

The first clear-cut record of this species for Canada is provided in a collection by P. Maycock from "dry prairie, Ojibway" near Windsor in October 1969. It was collected again in 1971 at the same locality and also at nearby La Salle prairie; both specimens were mixed with the rare *Sporobolus asper*. Earlier records are either incorrect or unsubstantiated by specimens. For example, Dodge (1915) reported it as "abundant in spots on dry ground on Squirrel Island," but no supporting specimens can be traced and no *Aristida* is given for Lambton County by Gaiser and Moore (1966). The sites south of Windsor are now preserved because of their characteristic flora, and arrow feather three-awn may well have been a longtime natural resident there. The species is reported in Ohio at the west end of Lake Erie, in Illinois, and in Wisconsin and southward.



Map 182. *Aristida necopina.*

55. Zoysia Willd.

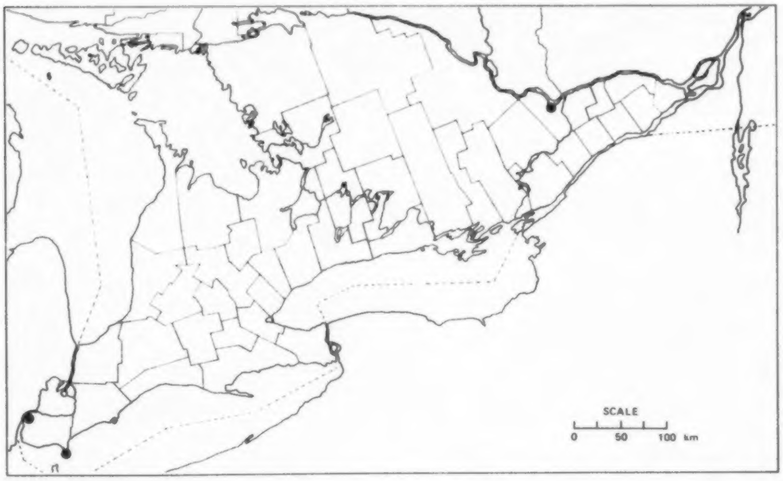
Low perennials with creeping rhizomes. Leaf blades rather short; ligule a minute row of hairs. Panicles ± spike-like. Spikelets 1-flowered, stalked, disarticulating below glume. Lower glume absent; upper glume hard, leathery, mucronate or shortly awned, completely enfolding the floret. Lemma thin, membranous.

1. *Zoysia japonica* Steudel

Map 183

Japanese lawn grass, zoysia

Species of *Zoysia* have been introduced from eastern Asia for use as lawn grasses in warmer parts of the United States. The earliest introduction was of *Zoysia japonica* and selections for winterhardiness have been made from it (e.g., cv. Meyer). Hybrids have also been produced with other



Map 183. *Zoysia japonica.*

species of *Zoysia* including *Z. matrella* (L.) Merr. and *Z. tenuifolia* Willd. ex Trin. Selections from these have been tested in the United States and promoted as low-growing, tough-sodded turf grasses under various trade names. Such selections seldom produce inflorescences and are propagated by plugs containing portions of the hard underground runners. At Ottawa, the cultivar Emerald (referred to *Z. japonica* × *tenuifolia* by Hanson 1972) has proved to be moderately hardy, but it is slow in greening in the spring and soon becomes lost in the better adapted lawn species. Samples thought to be couch grass have been submitted for identification by lawn owners in Ottawa, Windsor, and elsewhere from time to time since 1955. A large patch of the species was found in 1976 among natural vegetation in Point Pelee National Park (Catling et al. 1978).

56. Diplachne Beauv.

Tufted annuals (or perennials). Culms leafy throughout. Leaves with flat, linear blades; ligule membranous. Inflorescence a panicle of numerous simple branches along the upper portion of the culm. Spikelets shortly stalked to subsessile, indistinctly secund on the slender rachis, 5- to 12-flowered, disarticulating above the glumes and between the florets. Glumes unequal, shorter than lemma of lowest floret, acute, awnless, 1-nerved. Lemmas ± rounded on the back, obtuse to acuminate but minutely toothed at the apex, mucronate to shortly awned, 3-nerved.

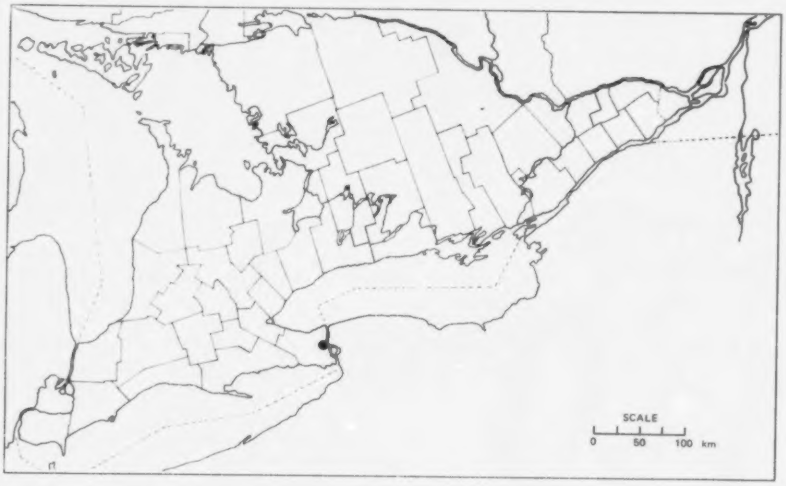
1. *Diplachne acuminata* Nash (*Leptochloa fascicularis* (Lam.) A. Gray, pro parte; *L. fascicularis* var. *acuminata* (Nash) Gleason; *L. acuminata* (Nash) Mohlenbrock)

Map 184

sprangletop

The first record of this genus and species occurring in Canada is from a collection by P. M. Catling and K. L. McIntosh made in 1976 in a railway yard near Niagara Falls, and reported under the name *L. fascicularis* var. *acuminata* by Catling et al. 1978. This was found in the same area, and at the same time, as *Tridens flavus*, another genus and species new to the Canadian flora. Hitchcock and Chase (1951) include *Diplachne* within *Leptochloa* but, as demonstrated by McNeill (1979), the two genera, though closely related, can be distinguished readily and should be maintained. Hitchcock and Chase (1951) also recognize only one species for all the large, annual, awned sprangletops, but Fernald (1950) recognizes three species in this group of *Diplachne* (*D. fascicularis*, *D. acuminata*, and *D. maritima* Bicknell) whereas Gleason (1952) and Gleason and Cronquist (1963) treat these same three taxa as varieties of the one species. The three taxa are distinguishable on glume, lemma, and awn lengths and each is characteristic of different habitats. *D. acuminata* represents plants with lemma awns rarely more than 1 mm long, and relatively long glumes (lower 2–3.5 mm, upper 3.5–5 mm) and lemmas (4–5 mm), that are found principally as weeds in waste places such as along railroads. Other plants with longer awns (*D. maritima*) or with shorter glumes and lemmas (*D.

fascicularis) are found mainly in natural habitats such as brackish shores or sloughs (cf. McNeill 1979). The Ontario collection is of the short-awned large-flowered adventive taxon; following Mohlenbrock (1973) this is treated as a distinct species.



Map 184. *Diplachne acuminata.*

57. Eleusine Gaertner

Annuals. Leaf sheaths compressed. Inflorescence of 2 to several rather stout digitate spikes at the top of the culms. Spikelets few- to several-flowered, sessile along one side of the rachis. Glumes unequal, awnless, shorter than the lemma of the lowest flower. Lemmas acute, awnless, with 3 nerves close together forming a green stripe along the keel. Grain dark-brown, wrinkled, breaking readily from the dry membranous pericarp.

The genus is of economic importance in parts of the Old World tropics, where finger millet (*E. coracana* (L.) Gaertner) is an important staple food. It is represented in Canada by only one species, an introduced weed.

1. *Eleusine indica* (L.) Gaertner

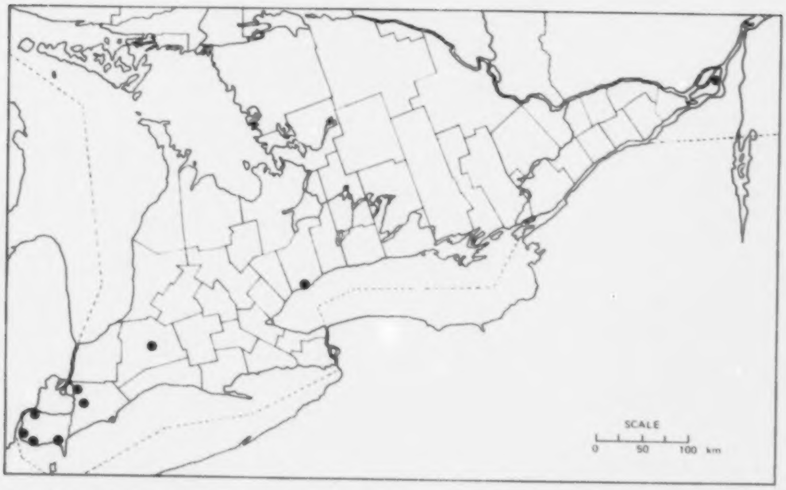
Plate 52, Map 185

goose grass, wire grass

The occurrence of *Eleusine indica* in Canada is not mentioned in most manuals although it has long been known as a weed throughout the United States. Dodge (1914) reported it from the Ohio shore opposite Point Pelee, and Zenkert (1934) from Buffalo, where it was first known in 1923. The species was reported as occurring at "Hamilton" by Buchan (1874) and Dickson and Alexander (1897), but no substantiating specimens are known.

The first reliable Canadian record of *E. indica* is from Walkerville, a suburb of Windsor, in 1922. Further spread in Essex, Kent, and Middlesex counties is indicated by subsequent collections at Harrow in 1932, Chatham in 1946, Wallaceburg and Amherstburg in 1948, Leamington Station in 1953, and at London in 1960. It has also been found in streets in Toronto (1953) and Montreal (1949), probably representing separate introductions with seed importations.

In parts of the United States, goose grass is an abundant weed. It is persistent in gardens, waste places about towns, and along roadsides. The remarkably tough stems and roots allow it to withstand a great deal of wear from treading, and it is often found on paths or in the crevices of sidewalks and pavements.



Map 185. *Eleusine indica.* All known Canadian records from the area covered by the map are plotted.

Cynodon dactylon (L.) Pers.—This species, known as Bermuda grass, is recorded by Dickson and Alexander (1897) in their checklist of the flora of the Hamilton district. This appears to be based on a specimen under this name collected by A. Alexander at the "Head of Wentworth St., Hamilton" in 1890. The specimen was misidentified and is actually *Digitaria sanguinalis.* Another specimen from Ontario exists under this name collected by Scott at the "Ball grounds, Toronto." It is in a vegetative condition and cannot be identified with certainty, but it is another introduced creeping grass, not *C. dactylon.* Bermuda grass is a valuable lawn and pasture species in the southern United States, and although it may turn up from time to time in Ontario, it is not sufficiently hardy to persist. North of the United States it is known as a casual only in coastal British Columbia and in Miquelon.

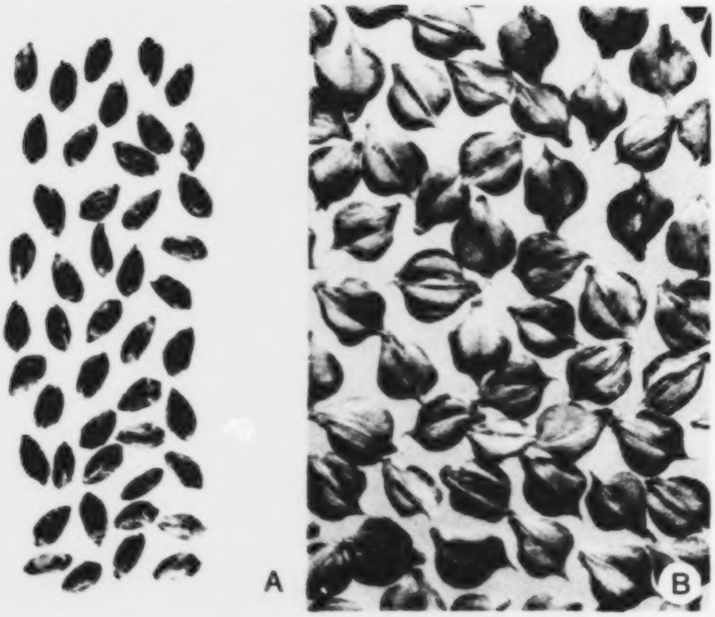


Plate 52. *A*, Caryopses of ***Eleusine indica*** with loose pericarp (Dore 8769); *B*, Spikelets of ***Beckmannia syzigachne*** (Garton 9329).

58. Beckmannia Host

Tufted or rhizomatous annuals or winter annuals. Foliage pale green, hairless; stalks soft and somewhat spongy because of the overlapping loose and inflated sheaths; ligule long, membranous. Inflorescence of numerous spikelets arranged in two rows on short one-sided spikes and combined into an elongate ample panicle. Spikelets 1- or 2-flowered. Glumes equal in length, wide, inflated, bowed-out, wrinkled, with short sharp tips. Lemma thin, with a sharp curved tip protruding beyond the glumes.

Spikelets 1-flowered; anthers about 0.5 mm long; plants tufted, soft-stemmed; native, or introduced from western North America .... 1. ***B. syzigachne***
Spikelets 2-flowered; anthers about 1.5 mm long; plants rhizomatous, hard-culmed with haplocorms; introduced from Old World .... ***B. erucaeformis*** (p. 379)

1. *Beckmannia syzigachne* (Steudel) Fernald

Plate 52, Map 186

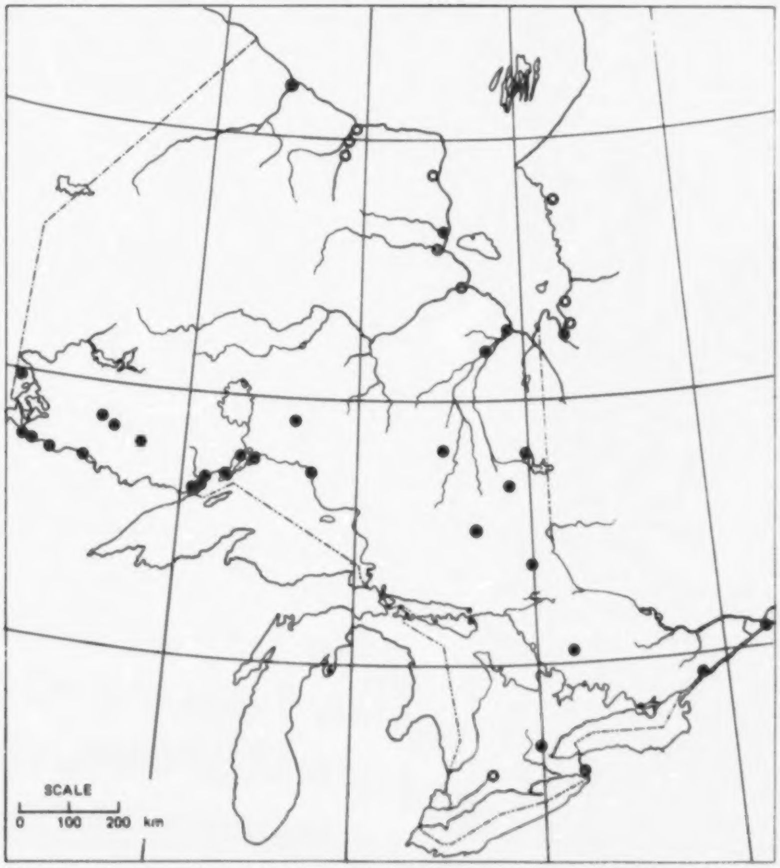
American slough grass

A native grass common in the prairies, *Beckmannia syzigachne* ranges eastward rather sparsely as far as the head of Lake Superior, then northeast into the Moose River drainage and the lower reaches of other rivers draining into James Bay and southern Hudson Bay, and then into central Quebec. In this northern drainage area it is relatively common, inhabiting flood-eroded shores where its inflated spikelets are carried by water.

Elsewhere in northern Ontario, the species appears to have been introduced by human agency since European settlement. At localities such as Ignace, Kenora District, Rainy River, Fort Francis, Longlac, Thunder Bay District, and Kapuskasing, Cochrane District, it has been found at construction sites, moist timber yards, and similar habitats.

In southern Ontario the species is known only as an introduction and apparently as a rather recent one. It was found at Rockwood, Wellington County, in 1946, at Prescott in 1960, and at London in 1968. It was also collected in Montreal in 1933 and Quebec City in 1934. The earliest records from New York State are at Ithaca in 1918 and Buffalo in 1924.

The species might prove valuable as a hay grass for flooded soils in the northern parts of the province.



Map 186. *Beckmannia syzigachne*. All known Canadian records from the area covered by the map are plotted.

The Ontario plants belong to subsp. *baicalensis* (Kusn.) T. Koyama & Kawano. The typical subspecies *syzigachne* occurs in eastern Asia (*see* Koyama and Kawano 1964).

Beckmannia erucaeformis (L.) Host—This is a European species, not naturalized anywhere in Canada. However, three specimens exist in the herbarium of the University of Guelph, which are said to have been collected, respectively, in Essex County, and in damp or marshy ground at Ottawa in 1938 and 1939. These specimens are identical in stage of development and color, and in the type of soil adhering to their roots. They probably reflect a single student collection from plants being grown as a potential forage grass at the Experimental Farm, Ottawa.

59. Spartina Schreber

Tall perennial grasses with hard, scaly, sharp-pointed rhizomes, tending to form dense clonal patches. Leaf blades coarse, harshly toothed on the margins, broad at base but inrolled and drawn out into a very long, thread-like, flexuous portion; ligule a row of short soft hairs, fused into a cartilaginous ring at base. Inflorescence of several, short-stalked, one-sided spikes arranged in a close raceme, spikes often appressed or slightly spreading from the main axis. Spikelets 1-flowered, laterally flattened, closely pressed one to the other in the spike. Glumes unequal in length, the lower shorter than the enclosed lemma, the upper surpassing the lemma, sometimes with a long awn-point. Lemma blunt, often equaled or exceeded by the palea. Grain tapering into a long, persistent style.

Leaf blades 5–15 mm wide, flat when fresh; spikes 5–30; lower glume almost as long as floret; upper glume with an awn 3–7 mm long .... 1. ***S. pectinata***

Leaf blades less than 3 mm wide, usually involute; spikes 1–5; lower glume about half as long as floret; upper glume awnless .... 2. ***S. patens***

1. *Spartina pectinata* Link

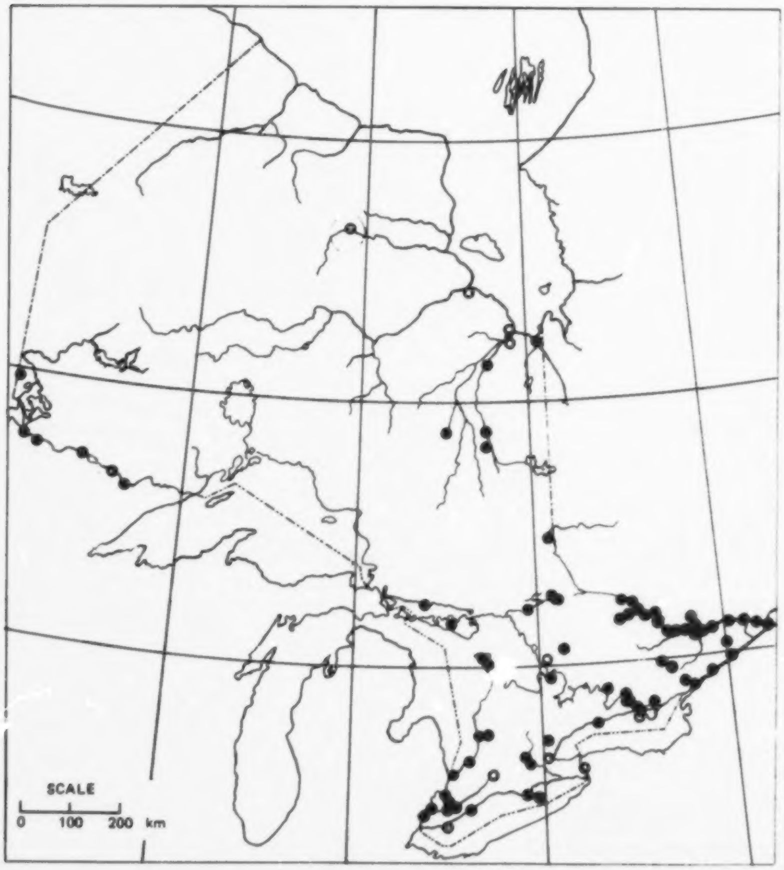
Plate 53, Map 187

tall cord grass

Spartina pectinata is a characteristic shoreline species often rooted in sand deposited among boulders by floodwater. It has, however, a rather scattered distribution, being abundant where present but lacking from many water areas in Ontario. On the other hand, around the sloughs in the Prairie Provinces and along the upper zone of coastal marshes in the Maritimes, it is more uniformly prevalent.

Scattered occurrences at Ingolf, Kenora District, and along the Rainy River as far east as Lac La Croix are extensions of its prairie distribution. The species is, however, not known from other drainages in the area west and north of Lake Superior. It is reported to be abundant along the lower Moose and Albany rivers but rare on the Attawapiskat River (Dutilly et al. 1954). It has not been collected along the east side of James Bay in Quebec or from the immediate shores of Lake Huron, but it is interesting to speculate why several specimens have been found growing along the shores of small lakes and streams flowing into the lake.

Numerous localities are known along the lower Ottawa River, but these are the result of special search and are widely scattered and usually distinctive as separate clones, all lying within the flood limit of the present river. On the St. Lawrence River below the mouth of the Ottawa River *Spartina* forms continuous marshes, but within Ontario only three patches have been reported. These probably represent introductions since settlement and none seem to have survived.



Map 187. *Spartina pectinata*. All known Canadian records from the area covered by the map are plotted.

The species also occurs at scattered locations in the Trent River system and at Port Hope on Lake Ontario, but it has been recorded from only a few other places in southern Ontario. In some of these it was said to be scarce (e.g., islands in the Niagara River, Zenkert 1934), and recent search in others (e.g., the Grand River shores) has failed to relocate the stands.

The tall cord grass plants growing along Lake St. Clair are taller and coarser than those found elsewhere in Ontario. They have more nodes, fuller inflorescences, and a late-flowering habit that has led to their misidentification with *S. cynosuroides* (L.) Roth, which occurs in the southeastern United States. These larger plants seem to represent *S. pectinata* var. *pectinata* in the sense of Fernald (1933*c*). The smaller, more slender-spiked plants occurring in the rest of the province fall within var. *suttiei* (Farwell) Fernald. However, the morphological variation is so great that no clear-cut distinction can be made (*see also* Mobberley 1956).

Somatic chromosome numbers of $2n = 40$ or $2n = 40$ plus 1 or 2 B chromosomes have been made by C. J. Marchant on material from Petawawa Forest Reserve rivers, from the shore of the Ottawa River at several points, and from McDonalds Corners on the Mississippi River in Lanark County. These plants are tetraploid (in *Spartina* $x = 10$, not 7 as at one time thought), but higher ploidy levels as well as tetraploids have been reported from parts of the United States (Mobberley 1956). Ottawa River specimens exhibit a high degree of seed sterility, perhaps because of clonal dispersal coupled with self-incompatibility.

Tall cord grass was harvested in great quantities in the Bay of Fundy area as fodder when horses were in wide use, and it may have been cut for the same purpose in Ontario. This could have allowed seeds to be carried to distant locations and may explain some of the scattered Ontario records. The rhizomes are shallow and the current segment often pulls up with the stem, but otherwise they form a meshwork that persists undecayed for at least 4 years. This meshwork is effective in impeding wave erosion and in stabilizing deposited sediment.

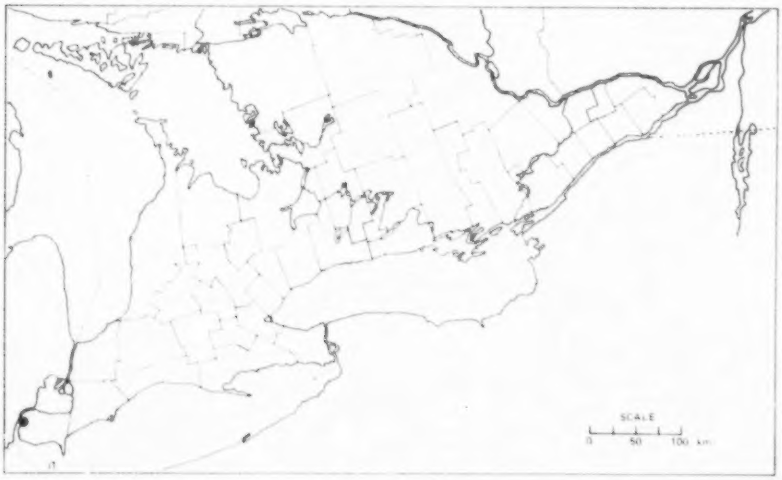
The record of *S. gracilis* Trin. from southern Ontario (Boivin 1967) is based on a misidentified specimen of *S. pectinata*.

2. *Spartina patens* (Aiton) Muhl.

Map 188

saltmeadow cord grass

Spartina patens is a species characteristic of coastal salt marshes and sands from Quebec to Florida and Texas. In Ontario it was discovered on open saline flats near Windsor by P. Catling in 1975. The species is also known from inland localities in Michigan and New York. One of these localities, the salt marshes on the southwest side of Detroit, is said to represent a native occurrence (Voss 1972*a*). However, the plants from Windsor, which were found beside the Windsor Salt Factory in an industrial area on the east side of the city, do not seem to be native. At this site *S. patens* was associated with other characteristic saline or alkaline species with very diverse natural distributions: ***Solidago sempervirens***, also a species of the eastern seaboard, ***Muhlenbergia asperifolia***, a western species, and ***Pluchea purpurascens***, an adventive from farther south.



Map 188. *Spartina patens*.

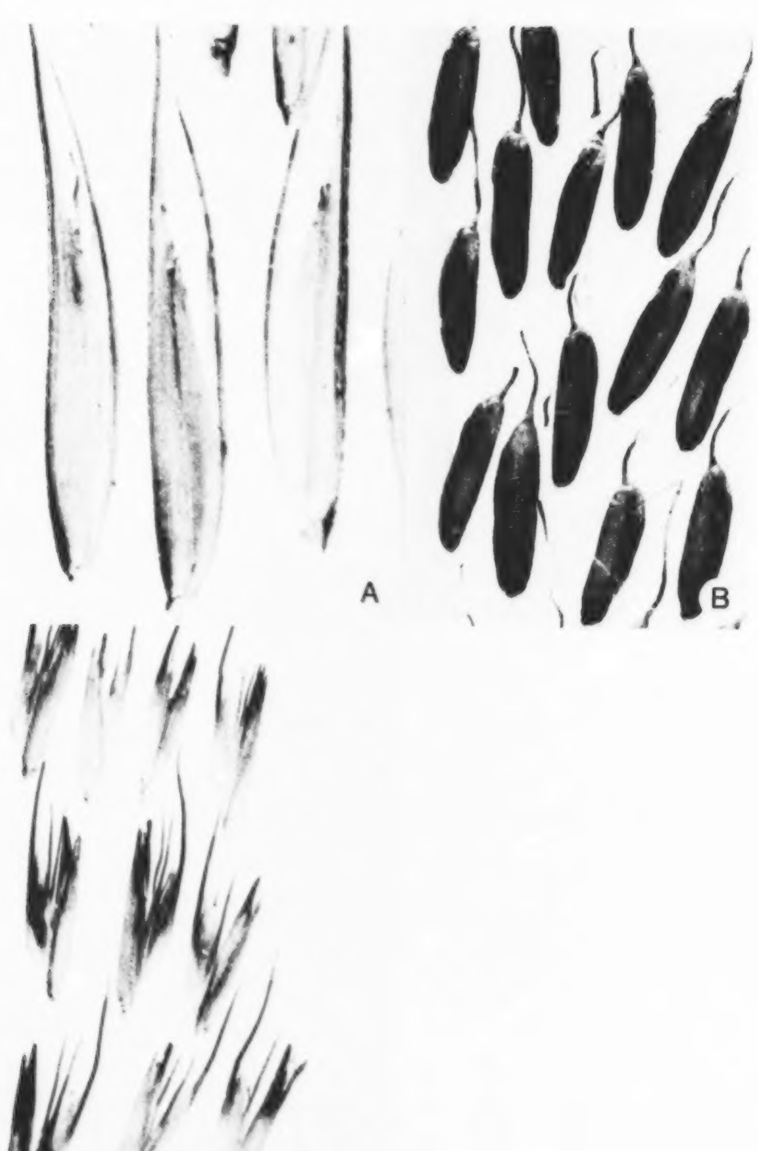


Plate 53. *A*, Spikelets of *Spartina pectinata* (Minshall 1995); *B*, Caryopses of *S. pectinata* (Dore 20167); *C*, Spikelet pairs of *Bouteloua curtipendula* (Dore 13537).

60. Bouteloua Lag.

Usually perennial grasses, the Ontario species growing densely in patches from short scaly rhizomes. Leaf blades narrow, often inrolling; sheaths hairy; ligule short, of stiff hairs fused together at their base. Inflorescence slender, of usually numerous small spikes, each attached to the main axis by a short stalk bent in such a manner as to form a loose one-sided raceme of pendulous spikes. Spikes of few to many spikelets arranged in two rows on one side of the rachis; rachis characteristically prolonged into a naked point beyond the spikelets. Spikelets 2-flowered, the upper floret sterile and modified into a 3-awned structure, the lower fertile and bearing three short terminal awns.

The genus includes a large group of range grasses important in the southwestern United States.

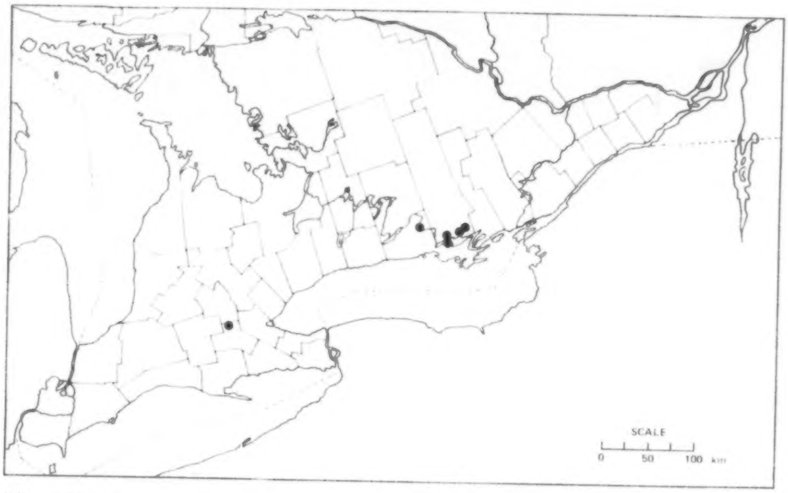
1. *Bouteloua curtipendula* (Michaux) Torrey

Plate 53, Map 189

blue grama, side oats grama

A very rare grass in Canada, *Bouteloua curtipendula* is now approaching extinction in Ontario. In Macoun's *Catalogue* (1888), under the synonym *B. racemosa* Lag., it was reported from Healey Falls on the River Trent in Northumberland County and at Shannonville Station about 50 km away, in Hastings County. These records are supported by specimens dated 1862 and 1866, respectively. In 1947, after much search, the species was relocated at Shannonville about 1 km east of the station-house on the north side of the C.N.R. tracks. This is probably the original site and in 1947 there was a single dense patch, about 3 m in diameter growing in shallow soil on top of a low limestone cut, in association with alien turf grasses. In 1951, the same patch had diminished to a few clumps. Examination of the Healey Falls site failed to relocate the plant, although a suitable habitat supporting other "prairie-relict species" still exists there.

Three other patches have, however, been found in the Shannonville area: at Point Anne in 1963, on Massasauga Point, about 2 km away; across



Map 189. *Bouteloua curtipendula*.

the Bay of Quinte in Prince Edward County in 1964 and about 8 km NE of Shannonville in 1967. All these were on the shallow limestone barren and are considered to be natural occurrences despite the long history of settlement in the region. The closest localities to these, are in the Hudson Valley in New York State.

The only other record from Ontario is at Galt (Cambridge) (Herriot 1908); this was relocated by Montgomery in 1956 at Spottiswood Lakes, some 16 km south of Cambridge. This highly localized patch was then reduced to about 3 × 6 m in extent, by encroaching cultivation. *B. curtipendula* was found here in association with *Andropogon gerardii*, *A. scoparius*, *Sorghastrum nutans*, *Bromus kalmii*, *Panicum* sp., *Lespedeza*, *Lechea*, and *Symphoricarpos*. This represented a natural prairie on a dry gravelly limestone ridge among the oak woodland. In 1968, the site was observed to be completely cleared and cultivated. The specimens from Spottiswood Lake are peculiar in that the sterile floret is as large as the fertile and bears a long central awn between the two teeth as well as two equally large lateral awns. The "Ohio shore" station opposite Point Pelee, reported by Dodge (1914), is the nearest known stand to the south.

The Ontario populations of *B. curtipendula* belong to var. *curtipendula* in the treatment adopted by Gould and Kapadia (1964).

Bouteloua gracilis **(Humb., Bonpl. & Kunth) Lag. ex Steudel**—This species is listed for Hamilton by Dickson and Alexander (1897); the record is unsubstantiated, however.

61. Hierochloë R. Br.

Perennials with deep slender rhizomes. Foliage hairless, sweet-scented on drying. Panicles with rather few, usually golden brown, shiny spikelets. Spikelets with 1 fertile (bisexual) floret between 2 larger staminate florets. Glumes about equal in length, wide, thin, hairless. Lemma of staminate florets wide, coarsely hairy along margin, awned or awnless, as long as glumes; lemma of fertile floret firm, smooth below, hairy, awnless, slightly longer than staminate lemmas.

A. Lemma of staminate floret awned, the awn twisted below and exceeding the glumes; arctic or alpine species .... 3. ***H. alpina***
A. Lemmas all awnless or essentially so
    B. Panicle broad, spreading; culms and vegetative leaf blades about 20–40 cm long; species widely distributed .... 1. ***H. odorata***
    B. Panicle narrow, contracted; culms about 10 cm high; leaf blades shorter; dwarf species restricted to extreme north .... 2. ***H. pauciflora***

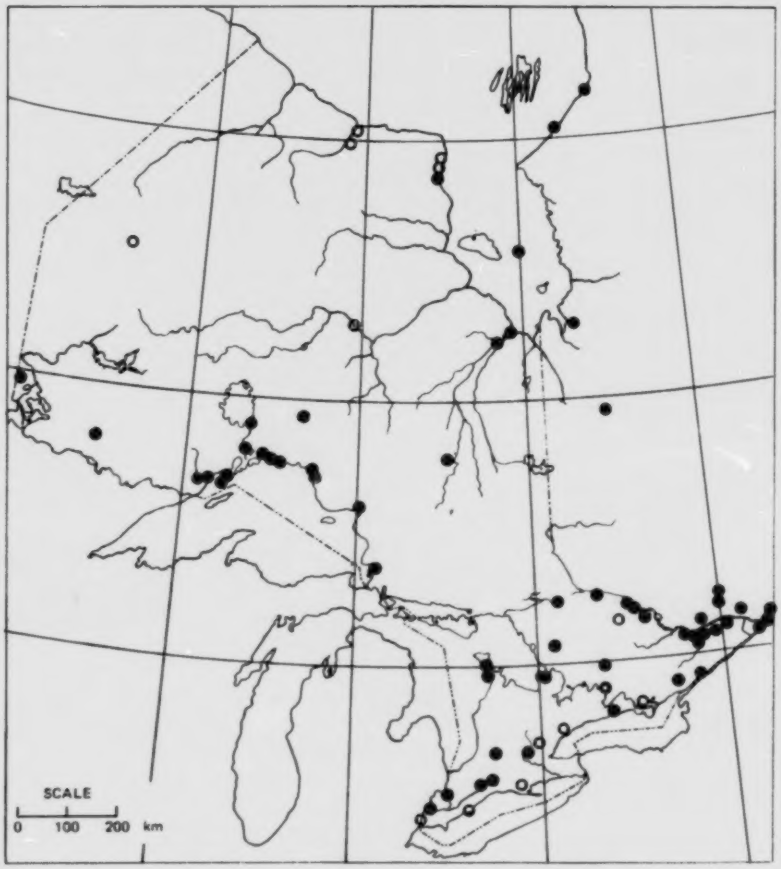
1. *Hierochloë odorata* (L.) Beauv.

Plate 54, Map 190

Indian sweet grass

Hierochloë odorata occurs throughout most of Ontario in open grassy places and is especially characteristic of wet, sandy soil on or near riverbanks and lakeshores. The species is abundant only in the northern Lake Superior region but is claimed to be prevalent also on the James Bay shore flats. The species is apparently absent from a large tract north of Lake Huron eastward into central Quebec. Across southern Ontario the stations are scattered and widely separated, even in an area such as the Ottawa Valley where the map records make it appear common.

No records are available for the counties along the St. Lawrence River except for a patch at Prescott on railroad fill, where it was probably introduced from Western Canada during the last century (Dore 1962). The localities in the southern and western counties are very scattered and reports for the Toronto area (Scott 1913), Wellington County (Stroud 1941), Norfolk County (Landon 1960), Belleville, and Point-aux-Pins on Lake Erie (Macoun 1888) are not supported by specimens and, without any other records from nearby localities, must be considered suspect.



Map 190. *Hierochloë odorata*. All known Canadian records from the area covered by the map are plotted.

At many sites the occurrence of *H. odorata* may relate to its use by native peoples. Mrs. Catherine Parr Traill (1885) recounts that only the Indians knew where to seek it, and that she herself had not seen it wild in the Peterborough area. Her description was based on material growing in her garden on Otter Island in Stony Lake (Dore 1966).

The species is very early flowering, like *Oryzopsis asperifolia*, and the panicles are conspicuous only in mid-May when they are in bloom. Later in the season the withered inflorescences become hidden among the dense foliage. The long, shiny green blades, arising separately from the rhizomes during the summer, were at one time used extensively by Indians in weaving and basketwork. The leaves inroll rapidly on wilting and become rather strong and flexible. The characteristic fragrance persists for years in baskets and woven mats. This fragrance, however, is not detectable in the fresh foliage, to which the coumarin gives a bitter taste. Cattle seem to shun this grass perhaps on that account, and the species has no forage value. Under cultivation the size and quality of the leaves for weaving can be improved.

When found in nature in southern Ontario, the isolated patches of Indian sweet grass are usually solid and extensive, suggesting clonal spread by vegetative means. Despite profuse flowering, seed-set is low or absent; this is of particular note in view of the widespread occurrence of agamospermy in the *H. odorata* complex. Somatic chromosome counts of $2n = 56$ have been reported on plants from four stations in the Ottawa Valley (Bowden 1960*b*).

The revision of the group by Weimarck (1971) assigns the Ontario plants to *H. hirta* (Schrank) Borbás subsp. *arctica* (C. Presl) G. Weimarck. Tsvelev (1973*b*), however, prefers to maintain the complex as a single species, referring these octoploid plants with more hairy lemmas to *H. odorata* subsp. *hirta* (Schrank) Tsvelev.

2. *Hierochloë pauciflora* R. Br.

Map 191

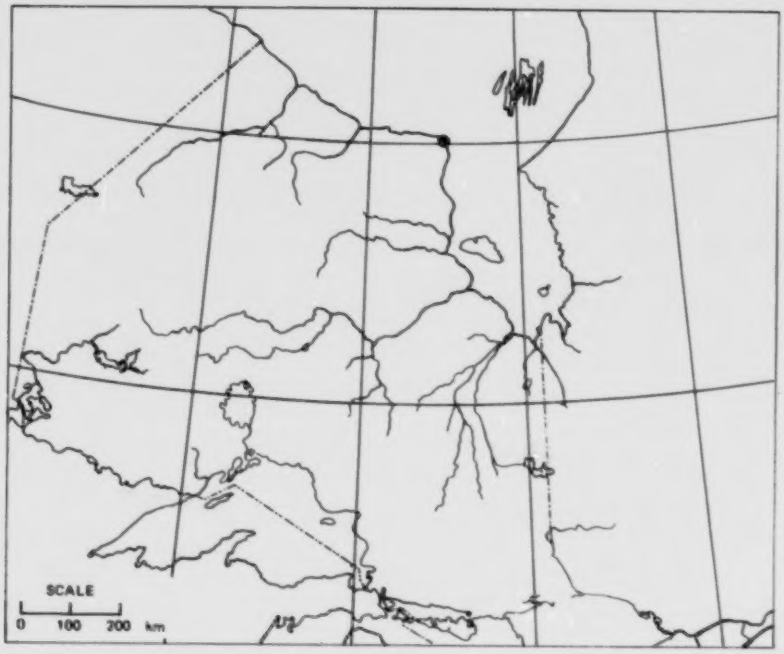
A species of the wet tundra of the far North, *Hierochloë pauciflora* occurs in Ontario along the Hudson Bay coast. Until recently it was known only from a single collection made by Dutilly and Lepage in 1953 at Cape Henrietta-Maria. In 1977, however, it was found at Shegamu River by J. L. Riley. Because the plants are small and made more inconspicuous by growing singly and not in clumps, the species is easily overlooked and may occur more extensively along this coast than these records suggest.

The Lepage collection is the basis of the description of f. *setigera* Lepage (Lepage 1954), a poorly separated variant in which most of the staminate lemmas have an excurrent midrib 0.3–0.5 mm long.

3. *Hierochloë alpina* (Swartz) Roemer & Schultes

Plate 54

Although *Hierochloë alpina* was recorded by Macoun (1888) from Moose Factory near James Bay, no authenticating specimens are known and it has only recently been discovered with certainty within Ontario (Riley 1979). The species has, however, been known for some time from the east coast of James Bay in Quebec province.



Map 191. *Hierochloë pauciflora.*

Two races exist, both apparently reproducing apomictically, and distinguishable morphologically by the form and position of insertion of the lemma awns. In the one (subsp. *alpina*) the awns are usually twisted at the base and in the upper male floret are inserted up to 2.3 mm above the base of the lemma. In the other race (subsp. *orthantha* (Sørensen) Weimarck) the awns are usually straight and are inserted higher up. The two races also appear to differ in their usual chromosome number; subsp. *alpina* is generally octoploid ($2n = 56$) and subsp. *orthantha* enneaploid ($2n = 63$). However, both exhibit aneuploidy and counts of $2n = 56$ and 58 are also reported for subsp. *orthantha*; the latter is from plants growing beside and indistinguishable from others with $2n = 63$ (Weimarck 1971).

Löve and Löve (1965) have suggested that only the enneaploid, which they call *H. monticola* (Bigelow) A. & D. Löve, occurs in the eastern Canadian Arctic and in Greenland. However, Weimarck (1971) reports both races on the eastern coast of James Bay, and either or both might be expected to occur in Ontario. Subsp. *alpina* has a holarctic distribution, whereas subsp. *orthantha* is in the main restricted to eastern Canada, the mountains of New England, and Greenland.

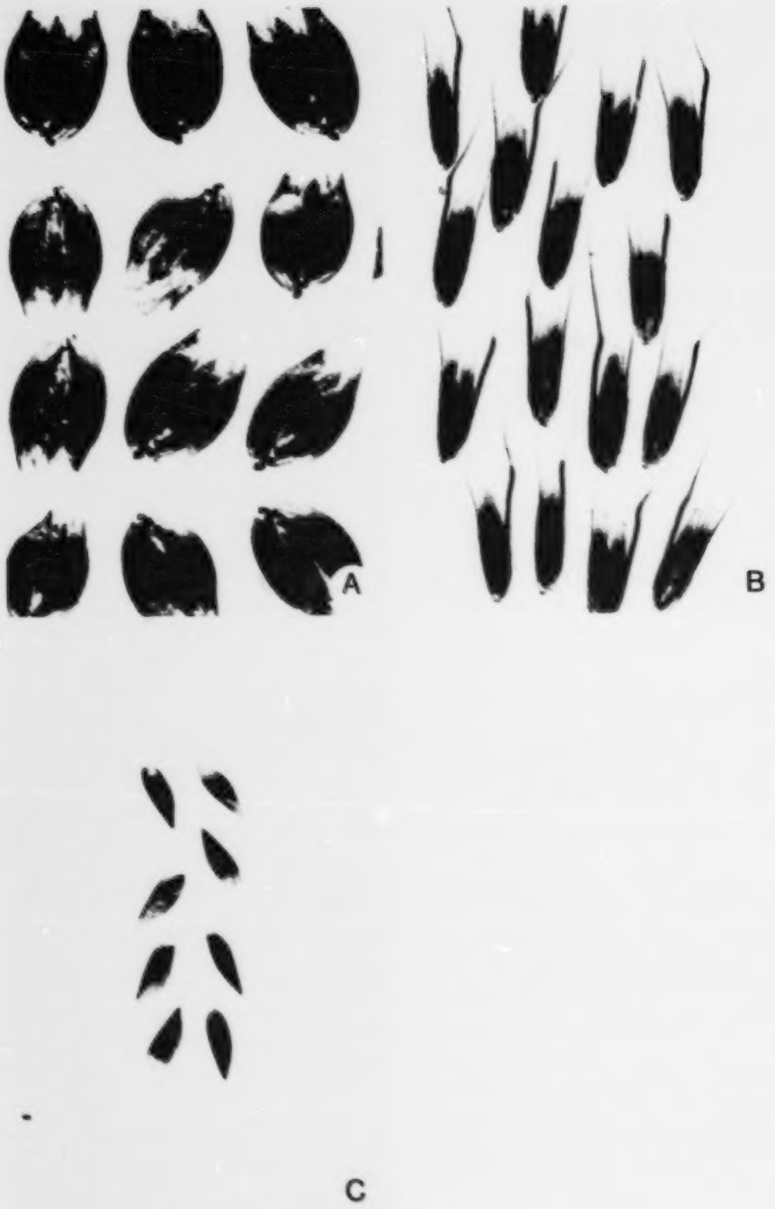


Plate 54. *A*, Floret groups of *Hierochloë odorata* (Calder and Cody 937); *B*, Floret groups of *Anthoxanthum odoratum* (Dore 21198); *C*, Fertile florets of *A. odoratum* (Dore 21198).

62. Anthoxanthum L.

Coumarin-containing, tufted, annual or perennial grasses. Leaf blades and sheaths soft-pubescent, the margin of the collar more conspicuously hairy; ligule membranous. Panicles dense, spike-like. Spikelets often golden brown, soft, composed of one fertile floret above two sterile florets. Glumes unequal in length, acute, thin, the upper somewhat wrapped around the florets; sterile florets appearing as brown, hairy, scale-like lemmas bearing long tightly twisted dorsal awns. Lemma of fertile floret shorter than and situated between the two sterile lemmas, awnless, smooth, shiny, and dark-colored.

1. *Anthoxanthum odoratum* L.

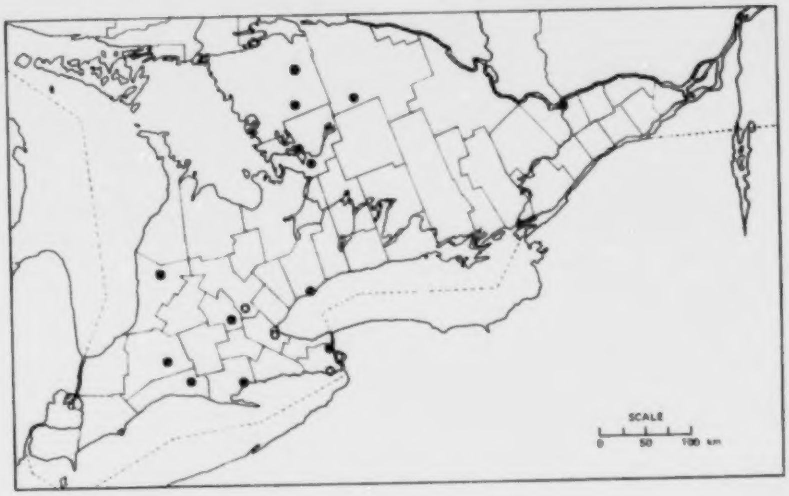
Plate 54, Map 192

sweet vernal grass

An introduced grass in North America, *Anthoxanthum odoratum* is abundant throughout the Maritime Provinces in old hayfields and waste places, as well as in the coastal part of British Columbia. It is, however, now very rare in southern Ontario, although it was formerly more widespread. The specimens from Ottawa, Kingston, Galt (Cambridge), Aylmer (Elgin County), Niagara, and London, as well as the reports from Toronto, Hamilton, and Port Colborne, are all over 50 years old. These plants undoubtedly arose from the meadow- and lawn-grass mixtures continually being imported from Europe at the time. They probably persisted for only a year or two, succumbing either to summer drought or winter cold. Recent collections exist from the Muskoka and Parry Sound districts and also from St. Josephs Island, Lake Huron, and Sault Ste. Marie (beyond map frame), where sweet vernal grass is found on moist roadsides and grassy beaches. Plants have also persisted in a part of the Arboretum at the Central Experimental Farm, Ottawa, since 1944; this is in a moist area where meadow foxtail also survives.

Sweet vernal grass is of little value for forage on account of its meager growth and stemmy tissue. Where it occurs in fields in Nova Scotia it seems to be avoided by cattle. The sweet odor develops on wilting and in the fresh state the coumarin expresses itself as a bitter taste, little odor being detectable.

Plants grown from seed collected at Rainy Lake (Bartlett Lake), Parry Sound District, were found to have a somatic chromosome number of $2n=20$ (Moore et al. 1976).



Map 192. *Anthoxanthum odoratum*.

63. Phalaris L.

Perennial or annual grasses. Foliage hairless; blades wide; sheaths split to base; ligule long, white, membranous. Panicles terminal, spike-like, open at anthesis. Spikelets laterally flattened, each with 1 perfect floret and 2 reduced sterile florets. Glumes equal in length and surpassing the florets. Lemma of the perfect floret smooth and firm, awnless, falling away readily at maturity with caryopsis enclosed.

Annual; panicle ovoid, dense and spike-like; glumes white with green stripes, the keel with a broad wing .... 1. ***P. canariensis***
Perennial; panicle elongate and branched, becoming closely contracted after flowering; glumes straw-colored, pale green or purple-tinged, the keel not broadly winged .... 2. ***P. arundinacea***

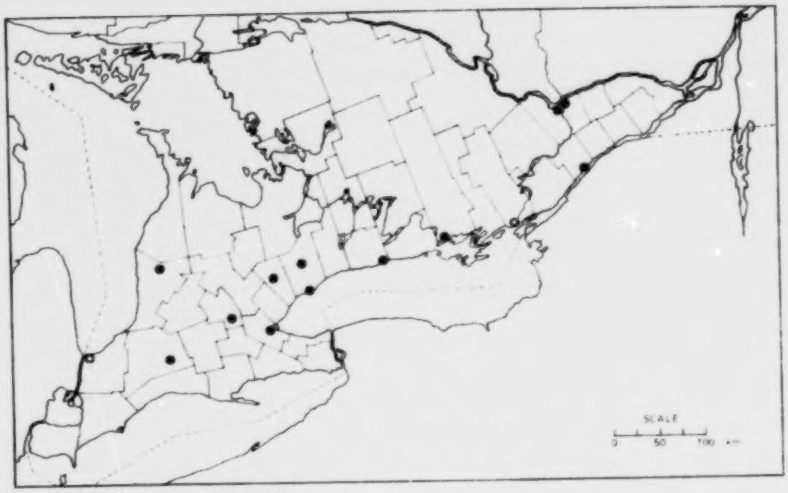
1. *Phalaris canariensis* L.

Plate 55, Map 193

canary grass

An erect annual of the Mediterranean region, *Phalaris canariensis* was at one time the chief constituent of birdseed for small cage-birds, from which it derives its common name. Viable seeds finding their way to rubbish heaps and dumps develop into mature plants, but in Canada they do not persist from year to year.

At the time of Macoun's *Catalogue* (1888), canary grass was already known from Ottawa, Prescott (in 1861, the earliest record in the province), Kingston, Belleville, Hamilton, and London. In 1895, Herriot annotated his specimen "riverside below the Egg Depot, Galt," suggesting that the grains were used also as chicken feed at that time. It seems to have become less frequent in later decades. Dodge (1915) said "occasional on roadsides and in waste places about towns and villages" in Lambton County but Gaiser in Gaiser and Moore (1966) did not find any plants in the county. Canary grass has been found as far north as Kapuskasing. The species is also sometimes used for dry bouquets.



Map 193. *Phalaris canariensis.*

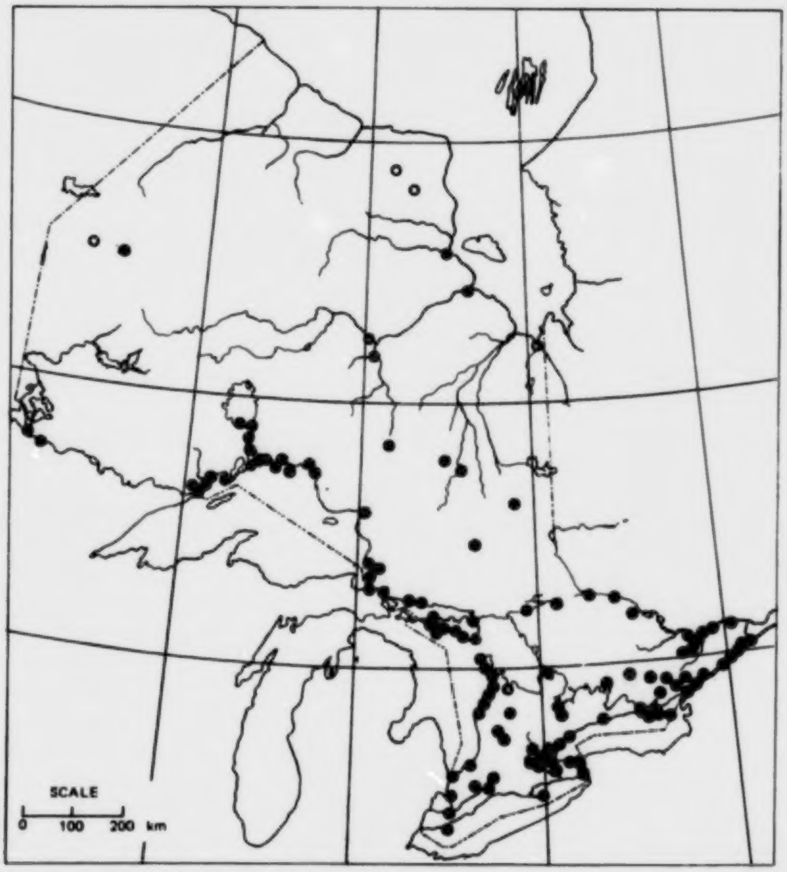
2. *Phalaris arundinacea* L.

Fig. 22, Plate 55, Map 194

reed canary grass

Phalaris arundinacea is a tall leafy species that produces dense stands by vegetative spread, and often forms solid stands in wet or mucky areas along margins of streams and lakes and in marshes. It has become important as a hay and pasture grass especially in south-central Ontario and can be grown successfully even on well drained soils. The commercial seed was originally of European source. The plant is, however, native to the northern hemisphere of both continents and grows wild in Ontario. There are no evident morphological characters to distinguish with certainty the native Canadian plants from those introduced from Europe. Consequently it is difficult at present to map separately the stands in Ontario that are native and those that are introduced.

The species ranges across the province to the head of Lake Superior with scattered localities northward. The most northerly seen by Lepage (1966) was at Shamattawa River at 54°13′ N. The concentration of plants along the rugged shores of Lake Superior and the Bruce Peninsula, in the shallow water among rocks and, along the flood shores of the French and Ottawa rivers below Mattawa, as well as those farther north, and appear to be growing in native habitats. Such plants are slender, and form loose stands with practically all the stems flowering; their panicles are often small and purplish. In contrast, at points inland from the lower Great Lakes, in marshes, ditches, and along sluggish streams, the plants form very thick and continuous stands, perhaps clones. These have leafy and comparatively few-headed stems with larger, usually greenish panicles, and are probably the progeny of seed of commercial cultivars from an Old World source. Indeed, these vigorous strains have taken over the flood bank meadows of some rivers so extensively, such as the Ottawa River below Ottawa, the St. Lawrence River below Prescott, and the Thames River below London, that the natural flora has become totally excluded.



Map 194. *Phalaris arundinacea.*

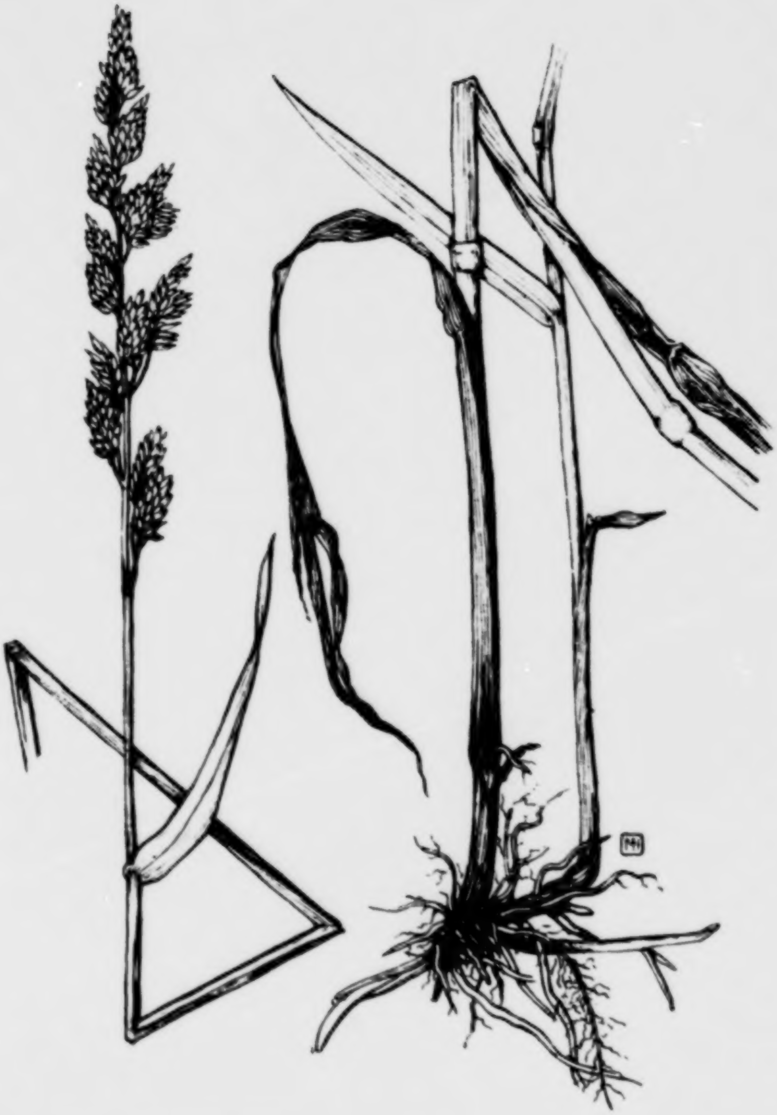


Fig. 22. *Phalaris arundinacea* L.

An ornamental variegated variant exists, known as ribbon grass or gardener's garter. This is best referred to as f. *variegata* (Parnell) Druce (var. *picta* L.). The earliest specimen is dated 1899. It is common in old gardens and now persists along ditches and in moist places around many villages and towns in the southern part of the province. This form does not flower as profusely as the typical form and probably does not retain its characteristic white-striped leaves when propagated from seed. There is also some evidence that the variegated feature is lost late in the season. Blades that develop high on the stem or from shoots at the margin of a clone are often also completely green.

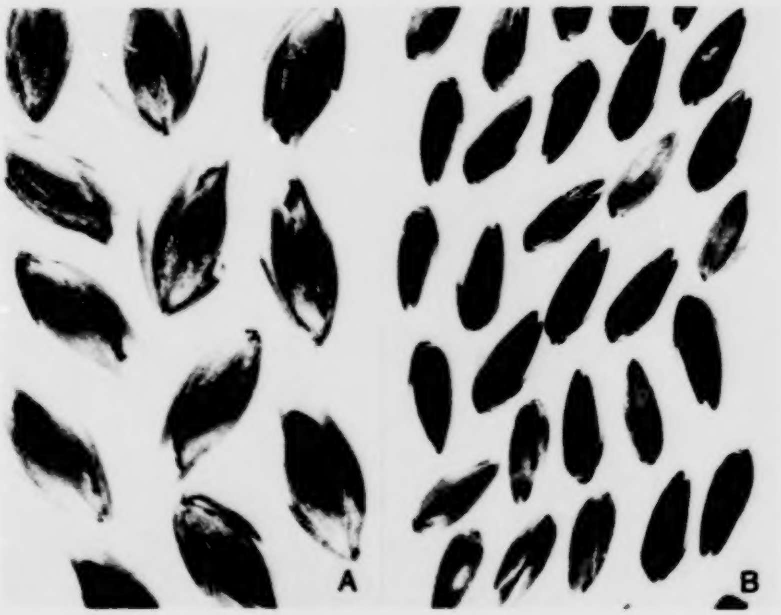


Plate 55. *A*, Floret groups of ***Phalaris canariensis*** (Dearness in 1888); *B*, Floret groups of *P. arundinacea* (Garton 6671).

64. Leersia Swartz

Broad-leaved, medium-sized perennials with scaly rhizomes. Culm nodes bristly-hairy. Ligule membranous. Inflorescence a loose panicle with spikelets appressed and overlapping along slender branches. Spikelets strongly flattened laterally, 1-flowered. Glumes absent. Lemma ovate, chartaceous, scabrous, awnless. Palea similar in texture, equal in length to lemma and flanged into it.

Lower panicle branches more than 1 per node; spikelets 5 mm long; rhizomes slender, deep in soil .... 1. ***L. oryzoides***

Panicle branches all single at the nodes; spikelets about 3.5 mm long; rhizomes short, superficial .... 2. ***L. virginica***

1. *Leersia oryzoides* (L.) Swartz

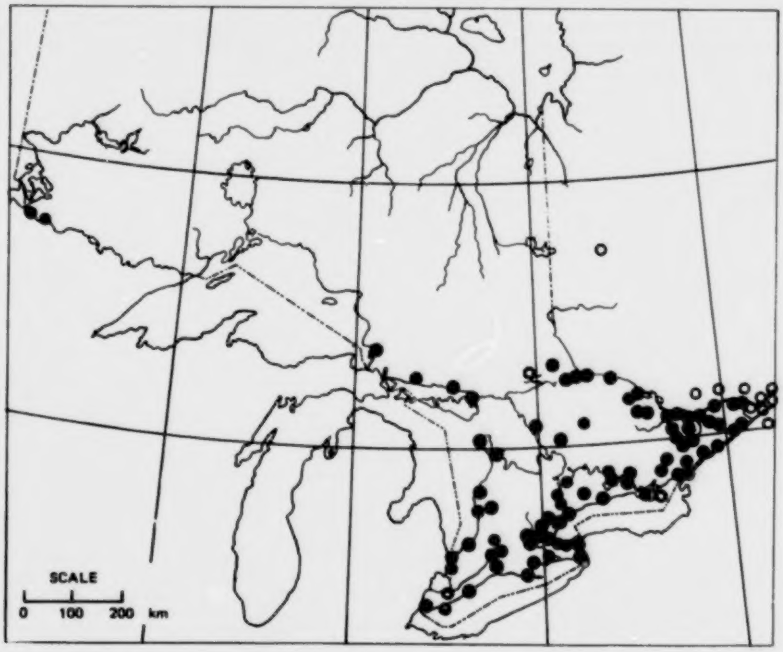
Fig. 23, Plate 56, Map 195

rice cut grass

A characteristic grass of wet soils, *Leersia oryzoides* is familiar to bare-legged walkers by its prickly foliage and clinging, scratching stems. It often forms dense, tangled masses owing to nodal branching in the latter part of the summer. Rice cut grass is a light yellowish green color and is noticeable as a zone or band around wet depressions, in ditches, and around sluggish streams and ponds.

Rice cut grass is found throughout much of southern Ontario, and although particularly abundant in the southeastern counties, it is also common in the south-central and southwestern counties. It is apparently scarce in the central Precambrian area, and perhaps absent in the central Paleozoic area. To the north it extends only as far as Haviland Bay in Algoma District, with outlying sites along the Rainy River in the west. The species is unknown at well-botanized areas such as Temagami, the Clay Belt, Manitoulin Island, the north shore of Lake Superior, Lake Nipigon, and the Thunder Bay District. It is introduced on the streets of Rouyn in northern Quebec.

Plants with panicles included within the sheaths, which produce cleistogamous seeds that do not ripen until late in September and do not shatter until the stem is dead, are usually found in the northern part of the species range in America and Europe. The phenomenon is well demonstrated in eastern Ontario and adjoining Quebec. For example, a specimen from one of the northernmost localities, Marten River north of North Bay, is of this type. These plants are usually confined to shores subject to prolonged flooding and consequently are more prevalent in wet years when the waters remain high during the summer. They are scarcely noticeable and are undoubtedly overlooked at many sites.



Map 195. *Leersia oryzoides*. All known Canadian records from the area covered by the map are plotted.

The specimens preserved invariably show numerous slender white rhizomes, perhaps because they release easily from the loose detritus and are washed clean by the water. Observations indicate that this habit of growth is a direct environmental response and not apparently genetically controlled (Pyrah 1969). These plants are also usually a dull green color, often with a purple tinge, and were once known as f. *inclusa* (Wiesb.) Dörfler.

Numerous specimens of this type have been collected along the Ottawa River and its tributaries, probably because most of the specimens were

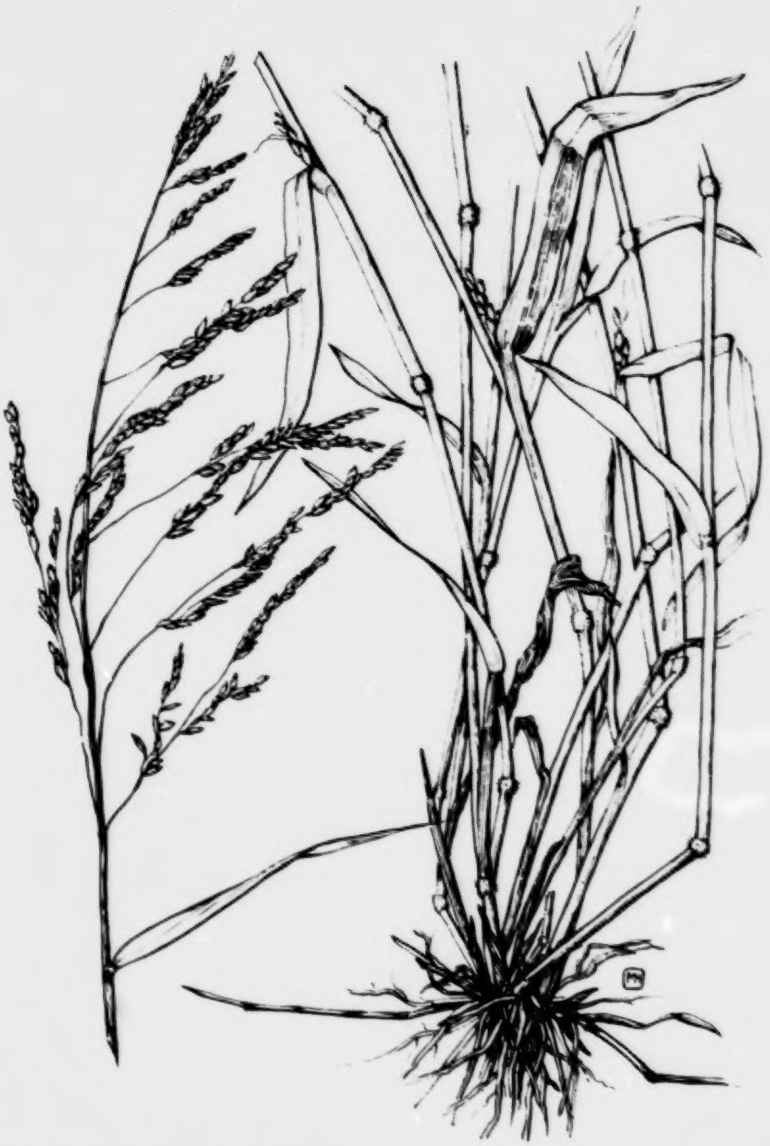


Fig. 23. *Leersia oryzoides* (L.) Swartz

collected by the senior author while engaged in late-season surveys of aquatic habitats in the vicinity of Ottawa. Botanists elsewhere in the province have passed over the plants as "nonflowering" and neglected to collect them.

Another variant in which the plants lack stem hairs has been called f. *glabra* Eaton. These plants are present in continually submerged habitats or under regular tidal influence on estuarine flats. Specimens have been gathered in Sharbot Lake, Frontenac County, and in the Mississippi River at Innisville, Lanark County. When transplanted to nursery soil, the plants develop the typical scabridity, and this is thus another example of phenotypic plasticity in *L. oryzoides*.

2. *Leersia virginica* Willd.

Plate 56, Map 196

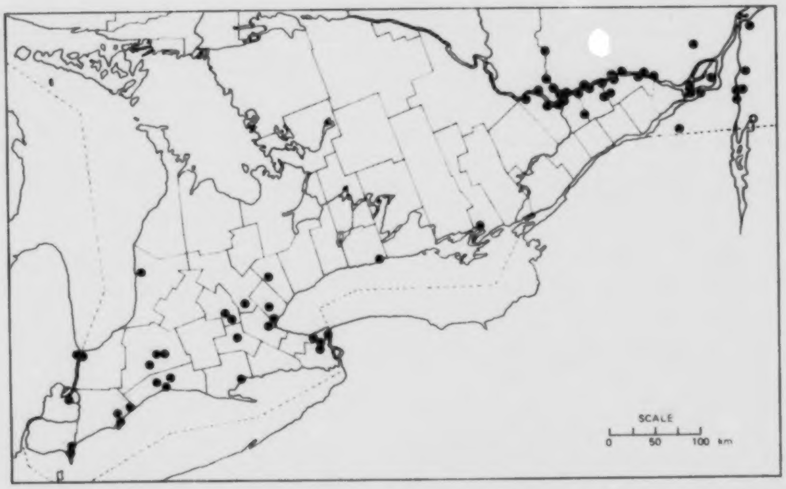
white grass

Leersia virginica is not as abundant or as widespread in Ontario as *L. oryzoides* and is found mainly in moist woodland rather than on open shores and in ditches. Its rhizomes are rather short with overlapping scales, which are usually purplish or bronze, and somewhat superficial in the leaf mold. Propagation in Ontario seems to be mainly by these vegetative structures dispersed by floodwaters; consequently the stands are rather dense and restricted to alluvial river bottomland. Under some conditions, however, well-filled caryopses are produced.

L. virginica occurs in three rather separate portions of southern Ontario: the flood shores of the Ottawa River below Galetta and the lower reaches of some tributaries of the Ottawa, all within the limits of its previously greater expanse; in the eastern Lake Ontario region along the lower Napanee River and at Port Hope; and across the southwestern counties from Peel to Lambton. The species is, however, apparently absent from many valleys with suitable habitats.

A record from Toronto (Scott 1913) is probably entered on the strength of a collection supposedly made at Snelgrove about 40 km to the northwest of the city. In some sites, such as at Rondeau Park, the grass grows luxuriantly, and in a shaded garden at nearby Ridgetown it was found to form weedy patches.

Plants with the margins of the lemma "coarsely ciliate-hispid" have been distinguished as var. *ovata* (Poiret) Fernald. In the typical var. *virginiana* the lemma margins are reported to be "smooth or barely ciliolate." All Ontario specimens have sufficient ciliation to make them referable to var. *ovata*, but the cilia are usually slightly shorter (0.2–0.3 mm) than in



Map 196. *Leersia virginica.* All known Canadian records from the area covered by the map are plotted.

some specimens from New York and Massachusetts (0.4–0.5 mm). There appears to be a complete gradation in this character, and without any correlated characters, varietal recognition does not seem useful (*see also* Pyrah 1969).

Oryza sativa L. Rice is one of the most important world cereals. The spikelets are similar to those of *Leersia* but larger and with minute glumes. The many cultivars are annuals, but some wild species of rice (i.e., of *Oryza,* not to be confused with wild-rice, *Zizania*) from Asia and Africa, are perennials. Plants of *O. sativa* have been grown to maturity experimentally at Ottawa and at Ridgetown in Kent County, and on a field scale on floodable land at Dunnville near the mouth of the Grand River in the Regional Municipality of Haldimand-Norfolk (Campbell 1968).

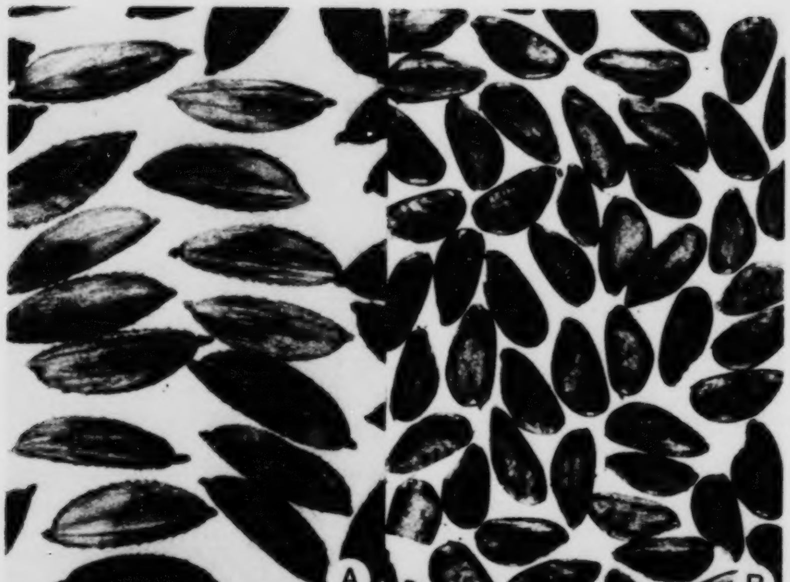


Plate 56. *A*, Spikelets of *Leersia oryzoides* (Dore 17603); *B*, Caryopses of *L. oryzoides* (Dore 17603); *C*, Spikelets of *L. virginica* (Dore 18641); *D*, Caryopses of *L. virginica* (Dore 18641); *E*, Spikelets of *Oryza sativa* cv. Bluebonnet (cultivated in Beaumont, Texas).

65. Zizania L.

Tall annual aquatic grasses with wide blades, soft reed-like stems, and septate culms. Foliage hairless; ligule membranous. Panicle large, monoecious with pistillate spikelets above and staminate ones below. Spikelets 1-flowered. Staminate spikelets pendulous on wide-spreading capillary branches, soon falling entire; glumes absent; lemma and palea thin, about equal in length, bright yellow or red-purple, widely spreading at anthesis; stamens 6. Pistillate spikelets erect on stiff, generally appressed branchlets; glumes absent; lemma long-awned, pale green, straw-colored, dark brown, or almost white; grain elongate, dark brown to black.

Zizania (wild-rice) is the only cereal crop that grows wild in Canada. A detailed account of its botany, distribution, habitat requirements, and utilization is given by Dore (1969).

Pistillate lemmas thin and papery, whitish, dull, minutely and sparsely scabrous all over; staminate florets thin, less than 1.5 mm wide .... 1. ***Z. aquatica***

Pistillate lemmas firm and tough, with a straw-colored ground (but variously tinged with red or purple), scabrous only in rows in the furrows, otherwise lustrous and smooth; staminate florets 1.5–2 mm thick .... 2. ***Z. palustris***

1. *Zizania aquatica* L.

Plate 57, Map 197

Plants 1.2–3 m high; leaf blades 1–5 cm wide; ligules 1–2 cm long; awn of pistillate lemma 2–7 cm long .... a. var. ***aquatica***

Plants 0.9–1.5 m high; leaf blades 0.3–2 cm wide; ligules 0.3–1 cm long; awn of pistillate lemma 1–3.5 cm long .... b. var. ***subbrevis***

1a. var. *aquatica*

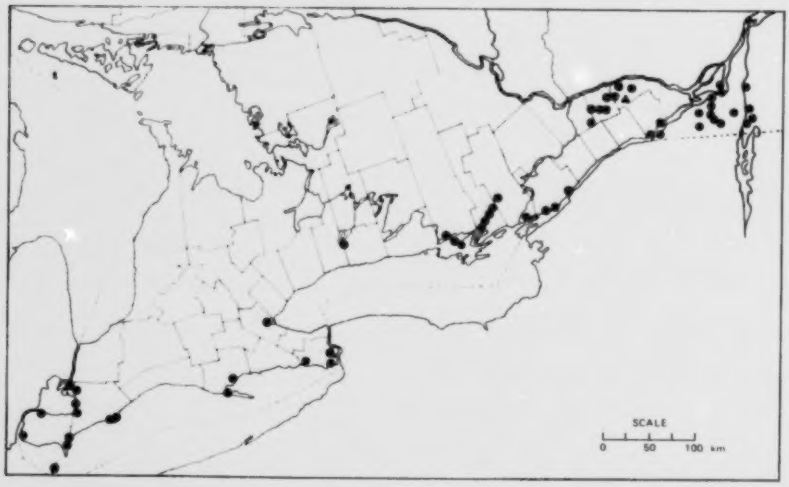
southern wild-rice

The typical variety of *Zizania aquatica* comprises tall handsome plants that are well known in the riverside marshes of the New England coast and as far south as the Gulf of Mexico. The variety reaches its northern limit in southern Ontario and adjacent Quebec. In Ontario it is somewhat localized, and occurs in only a few of the habitats available to it, such as the marshes of Lake St. Clair and its tributary creeks, the mouths of sluggish creeks near Point Pelee, Rondeau, and Long Point on Lake Erie, the lower reaches of the Napanee River and other localities in the Bay of Quinte, and the muddy mouths of some of the streams along the St. Lawrence River.

A well-known and extensive stand away from the lakeshores is at the causeway across the south end of Lake Scugog, Durham Regional Municipality. Specimens were not, however, gathered there until 1929, suggesting human introduction. Many of the small tributaries of the South Nation River in Russell County are also lined with plants of this variety.

Old specimens are known from Hamilton but a very early specimen labeled "Toronto, C.W., [C.W. stands for Canada West] Aug. 1848. Ex Herb. W. Hincks F.L.S." and the basis for a dot at Toronto in the map in Dore (1969), is probably a mislabeled duplicate of P.W. Maclagan's collection "Swamp near Amherstburg, C.W., August 1848." *Z. aquatica* is not known to occur at Toronto.

Southern wild-rice tends to remain green in the autumn until it is killed by frost. If it is grown in a greenhouse, it will continue growth as a perennial from new tillers for several years, but in nature it always behaves as an annual.



Map 197. *Zizania aquatica*. A solid circle (•) indicates records of var. *aquatica* and a triangle (▲) indicates the location where var. *subbrevis* also occurs. All known Canadian records from the area covered by the map are plotted.

1b. var. *subbrevis* Boivin

Smaller and shorter-awned plants of *Z. aquatica* occur in the South Nation River at Casselman, Russel County. They were first pointed out by Fassett (1924) and named var. *subbrevis* by Boivin (1967). Several other collections from the same drainage, which has a network of high-flooding and intermittent creeks, reveal an almost complete gradation from var. *aquatica*, through var. *subbrevis*, to the very low, short-awned var. *brevis* of the tidal flats of the St. Lawrence River. This last variety is estuarine wild-rice (Dore 1969), which is extensive on either side of Quebec City. Various combinations of awn length, leaf width, and stature are represented in the South Nation population. The type specimen happens to be considerably dwarfed in stature because it represents a plant browsed on during its early growth. About 7500 years ago the area of the South Nation drainage was influenced by estuarine waters of the retreating Champlain Sea, and var. *subbrevis* may represent the descendants of plants adapted to tidal conditions.

2. *Zizania palustris* L. (*Z. aquatica* L. pro parte)

Plate 58, Maps 198–200

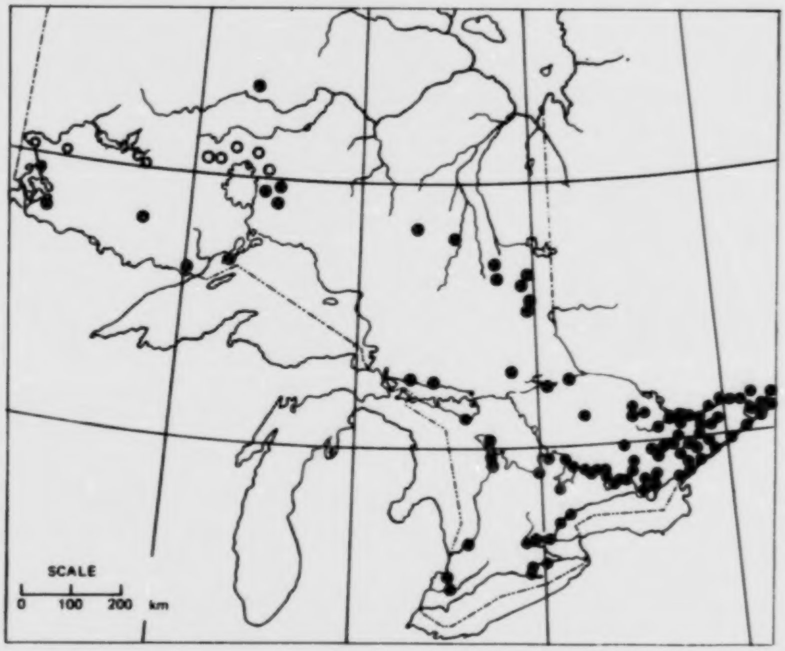
Plants extending 0.6–1.2 m above water; leaf blades 0.4–1.2 cm wide; ligules 0.3–0.5 cm long; lower pistillate branches bearing 2–6 spikelets; lower and middle staminate branches with 1–15 spikelets .... a. var. ***palustris***

Plants 1.2–2.4 m high, usually growing on wet banks; leaf blades 1–4 cm wide; ligules 1–1.5 cm long; lower pistillate branches with 11–29 spikelets; lower or middle staminate branches with 30–60 spikelets .... b. var. ***interior***

2a. var. *palustris* (*Z. aquatica* var. *angustifolia* A.S. Hitchc.)

northern wild-rice

Zizania palustris var. *palustris* is the common wild-rice throughout much of southern Ontario and is particularly abundant in some of the major rivers such as the Trent, Mississippi, and Rideau. Rice Lake on the Trent River derives its name from the stands that are known to have existed there during historical time and presumably also existed for a long time previously, supporting the ancient cultures located on its banks. The Ottawa River and its tributaries from the south have had good stands in their shallow waters and embayments, although some sudden disappearances have taken place in recent years, possibly because of pollution by detergents. In large portions of Ontario, var. *palustris* is sporadic or does not occur naturally;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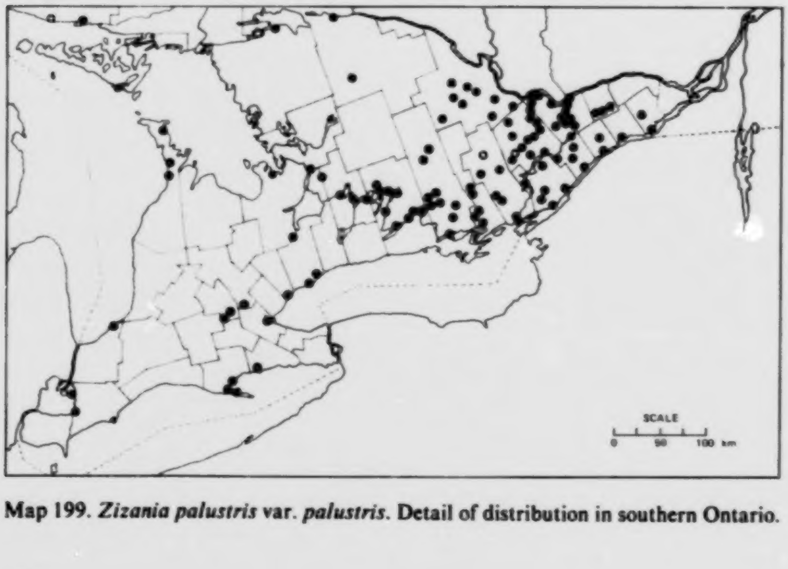
Map 198. *Zizania palustris* var. *palustris*.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Map 199. *Zizania palustris* var. *palustris*. Detail of distribution in southern Ontario.

Krotkov (1940) describes it as "somewhat rare" in the Bruce Peninsula and it is scarce throughout the southwestern counties other than Wellington and Waterloo. The 1860 record by Robert Bell at the mouth of the Mississagi River on Lake Huron probably represents a local introduction by the Indians. Wild-rice is not thought to have grown naturally in Algonquin Park or northward. The scattered stands that are now present throughout northern Ontario are the result of intentional planting in the past few decades, some of it massive. Because of the widespread and often secretive planting in remote areas by sportsmen and by conservationists, the original distribution of this important native cereal has become greatly obscured. The productive stands in the Lac Seul area and around Kenora in northwestern Ontario were apparently initiated by ancient Indian tribes. These stands have been extended greatly and new ones have been established in recent years as the value of the gourmet market has increased.

In contrast to *Z. aquatica*, this species is strictly annual, and its leaves and roots begin to die as soon as the grain is ripe and before the growing season is actually over.

A striking color variant of *Z. palustris* var. *palustris* has been found near Embrun, Russell County. All parts of the plant in direct sunlight, the leaf sheaths, blades, culms, and inflorescence, were deeply suffused with red-purple pigment. These plants, which have been called f. *purpurea* Dore, were growing in the same habitat with the more abundant ordinary green plants.

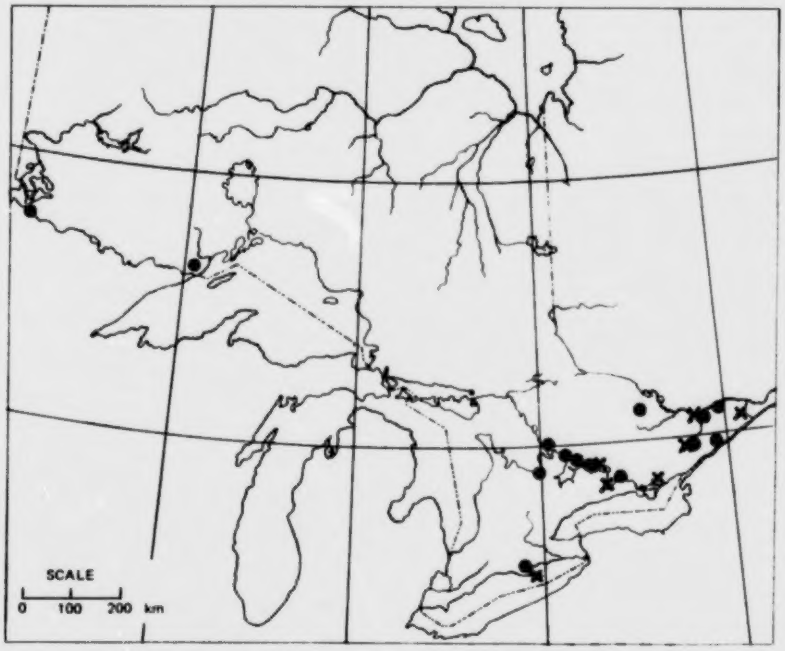
2b. var. *interior* (Fassett) Dore (*Z. aquatica* var. *interior* Fassett)

interior wild-rice

The plants of *Z. palustris* var. *interior* are almost as tall as those of *Z. aquatica* var. *aquatica* with fuller, sometimes more spreading, pistillate branches than those of var. *palustris*. These plants occur at a few scattered localities in Ontario and are the result of indiscriminate planting. The muddy flood shores of the lower Ottawa River have provided a good habitat for this variety, which seems to prefer exposed alluvial muds to permanent water. This variety also seems to be the "river-rice" designated as distinct in the Rice Lake area, and found localized on the shore of the Indian River at Keene. It has a slightly shorter grain than var. *palustris*, "lake-rice," and therefore it is not so desirable for those interested in commercial gathering.

When first described, *Z. palustris* var. *interior* was considered to be of hybrid origin between *Z. aquatica* var. *aquatica* and *Z. palustris* var. *palustris* because it seemed to combine the characters of stature and spikelet texture. This opinion has still to be demonstrated experimentally.

The variety seems rather to grade into var. *palustris* and is perhaps a member of that complex adapted for growth on shores that are not subject to inundation.



Map 200. *Zizania palustris* var. *interior*. A solid circle (•) indicates records of var. *interior* and a cross (**X**) indicates those of plants intermediate between var. *interior* and var. *palustris*.

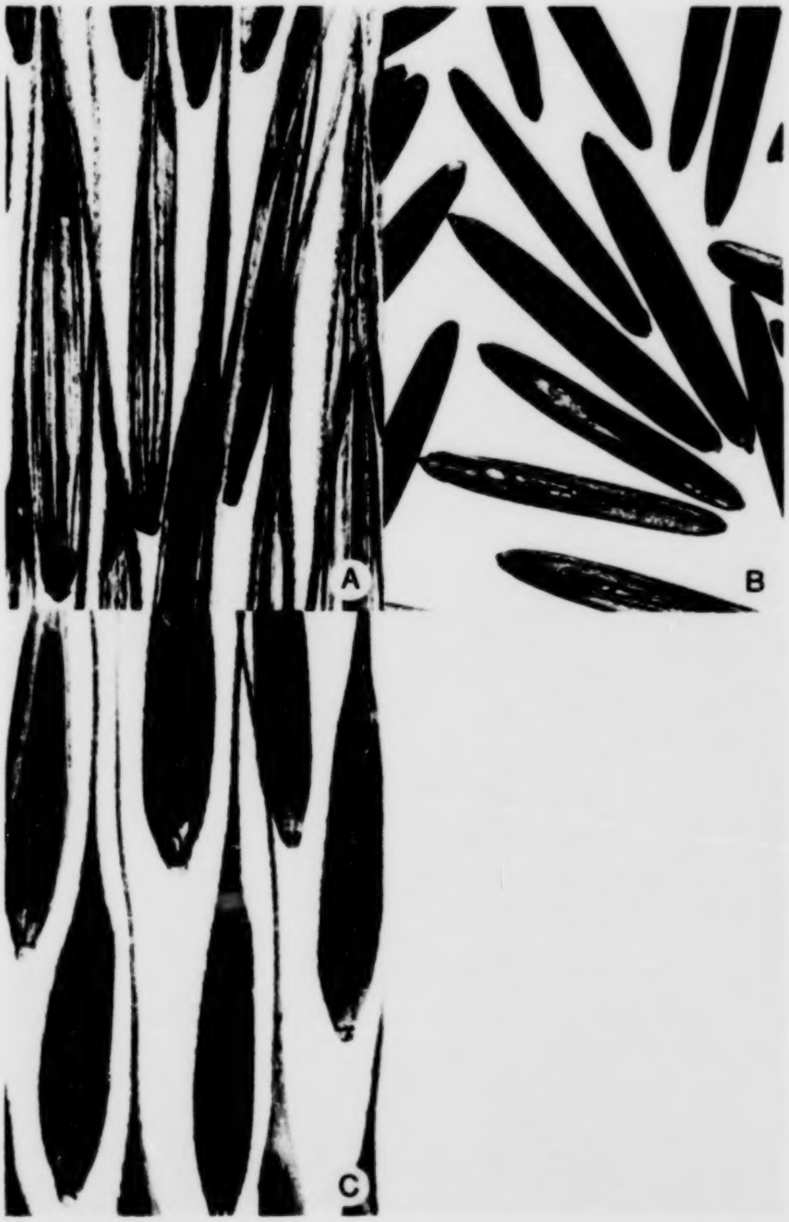


Plate 57. *A*, Spikelets of *Zizania aquatica* var. *aquatica* (Dore and Van Rens in 1955); *B*, Caryopses of *Z. aquatica* var. *aquatica* (Dore and Van Rens in 1955); *C*, Spikelets of *Z. aquatica* var. *subbrevis* (Dore 10567).

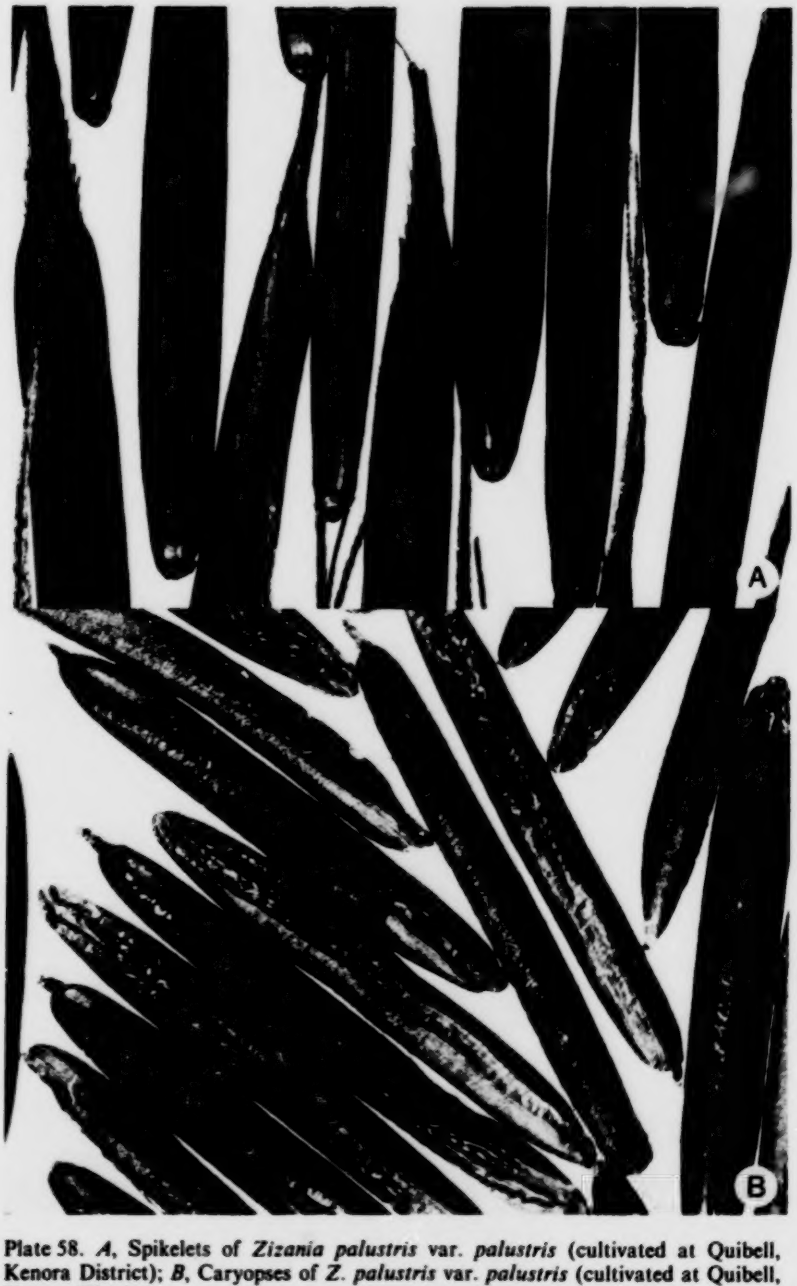


Plate 58. *A*, Spikelets of *Zizania palustris* var. *palustris* (cultivated at Quibell, Kenora District); *B*, Caryopses of *Z. palustris* var. *palustris* (cultivated at Quibell, Kenora District).

66. Digitaria Heister ex Fabr.

Annual grasses with tough culms, branching near the base and usually spreading along the ground, sometimes rooting at lower nodes. Leaves with soft blades; ligule membranous, conspicuous. Inflorescence of 2–10 slender spike-like racemes arranged in digitate fashion. Spikelets in pairs, borne on one side of a broadly winged, zigzag rachis and alternating on either side of the midrib; the shorter-pediceled spikelet of the pair lowermost. Spikelets with 1 sterile floret and 1 perfect terminal floret. Lower glume minute or wanting; upper glume one-half to as long as spikelet. Sterile lemma herbaceous, usually softly matted with short hairs; fertile lemma firm and smooth, its membranous edges enclosing the palea. Introduced weeds.

Leaf sheaths and blades papillose-pilose (uppermost blades sometimes hairless); lower glume minute (about 0.2 mm) but firmly herbaceous and evident; upper glume narrow and about half the length of the spikelet, exposing the upper part of the silvery or grayish brown fertile lemma .... 1. ***D. sanguinalis***

Leaf sheaths and blades hairless (except for the lowermost and for a few long cilia mainly at collar); lower glume absent, or if present a minute transparent membranous scale; upper glume as long as the spikelet, covering the dark brown fertile lemma .... 2. ***D. ischaemum***

1. *Digitaria sanguinalis* (L.) Scop.

Fig. 24, Plate 59, Map 201

large crab grass

A common and troublesome weed in vegetable and flower gardens, *Digitaria sanguinalis* now infests most towns in the southern part of the province. By germinating late in the season, young plants escape preplanting cultivation. By mid-August they have grown into large plants firmly anchored to the soil by adventitious roots from the lower nodes and are difficult to pull out intact. Inflorescences are quick to form and to drop their ripe grains. This crab grass also colonizes neglected sites such as dumps, roadsides, and waste places, or wherever the ground is loose and open and the soil rich. It does not seem able to compete with sod-forming grasses in good lawns and fields.

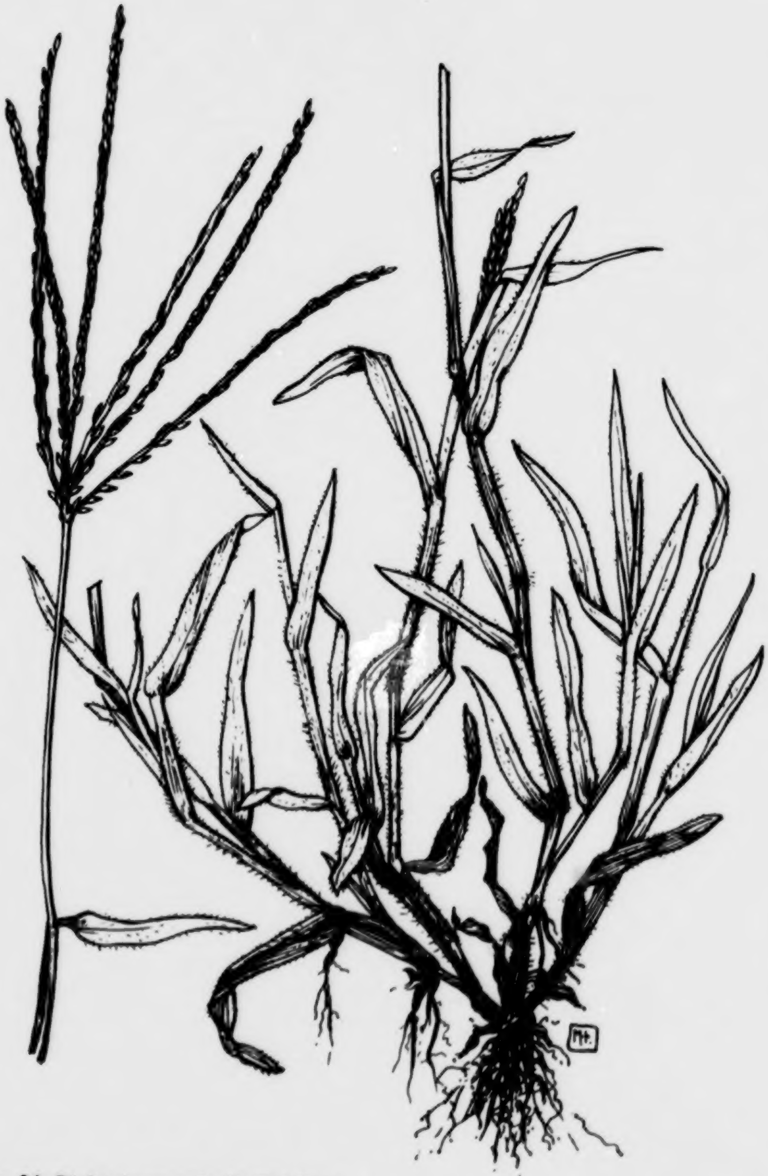
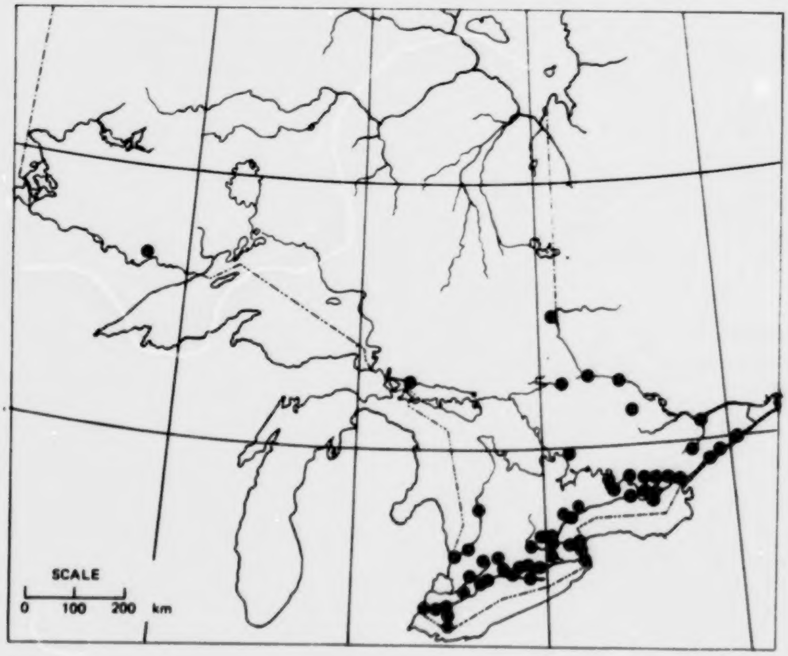


Fig. 24. *Digitaria sanguinalis* (L.) Scop.

In 1888, at the time of Macoun's *Catalogue*, the species was "sparingly introduced" and was reported from the following locations, with dates where known: Ottawa, Prescott 1862, Hamilton, Queenston 1885, Niagara 1877, London 1879, Port Dover 1880, and Point Pelee. The earliest of these specimens was that submitted to Macoun in 1862 by Mrs. B. French from "cultivated ground, west of Prescott." This was probably a new arrival because Billings in his thorough survey of 1860 in that district did not detect it. There is one older Ontario record, that from Malden, Essex County, by P. W. Maclagan dating from about 1845.



Map 201. *Digitaria sanguinalis*.

The weed subsequently increased rapidly and today it is ususally so common that botanists do not often collect it. Nevertheless, the species has apparently not yet reached every town in southern Ontario and it is not known to have penetrated the Bruce Peninsula and adjoining counties. Its progress northward and westward, by jumps, is indicated by these dates of the first record: Gravenhurst 1945, Mattawa 1946, Haileybury 1957, Quetico Park 1957, Lighthouse Beach 1958, Deep River 1962, and Blind River 1964. The assumption is that the seeds are being carried along with the soil surrounding annuals brought in as bedding plants. For example, at Eganville in 1960 the only plants seen were in a display bed of petunias in the town, and at Haileybury a specimen collected in 1957 came from a "flower bed by hotel."

2. *Digitaria ischaemum* (Schreber) Schreber ex Muhl.

Plate 59, Map 202

smooth crab grass

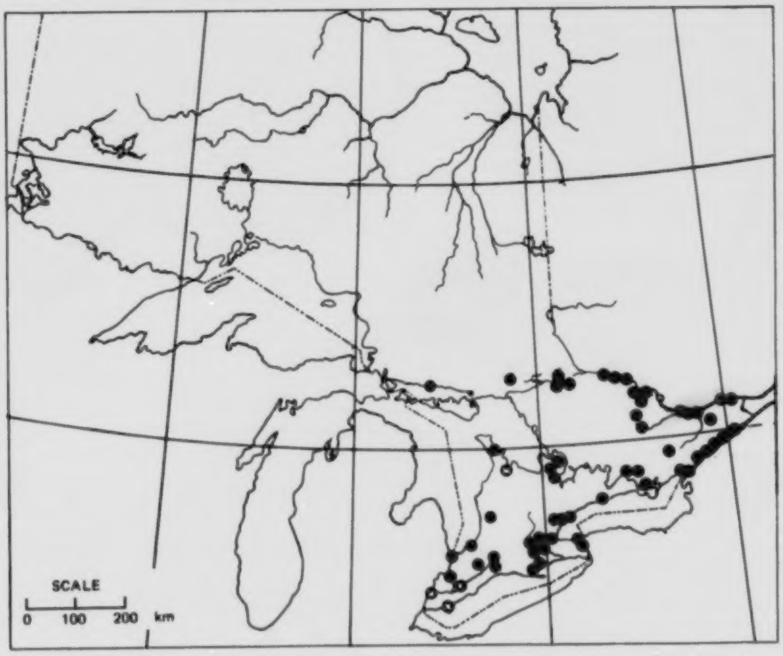
Digitaria ischaemum is now a troublesome weed in many Ontario lawns, especially in the older-settled parts of the province. The seeds germinate later than most annuals, but then grow rapidly, even during the dryness of midsummer, forming flat, many-rayed rosettes of branches that do not usually root at the nodes, but are inconspicuous and hidden by the other grasses. By late August, a purplish haze is imparted to the surface of the lawn by the slender racemes of spikelets that seldom extend much above the turf and are low enough partially to escape mowing. Near-ripe seeds mature in the clippings and are able to germinate the following year.

Herbicides are available to kill the germinating seeds, and the application of fertilizers is also recommended to encourage a vigorous growth of perennial turf grasses and to suppress, or at least obscure, the growth of crab grass.

Smooth crab grass is also found on paths, in thin pastureland, in pavement cracks, and on the gravel of roadways and railroads. It is obviously more resistant to wear and tear than large crab grass and is able to withstand poorer growth conditions. In these situations the plants become very small and depauperate, yet still produce large numbers of viable grains.

Macoun in his *Catalogue* of 1888 listed eight localities for the species. These with relevant dates (where known) are as follows: Ottawa 1880, Prescott 1860, Belleville 1877, Owen Sound, Hamilton, St. Thomas, London 1879, Chatham, and Windsor. Other early specimens are known from Snelgrove in 1890, Wingham in 1892, Kingston in 1893, Galt (now Cambridge) in 1897, and Niagara in 1898. No specimen has been traced to support Macoun's Owen Sound report, and none was collected in the area of the Bruce Peninsula until 1959, when plants were found in a potato patch at Lion's Head. The species was detected in a lawn at Sudbury in 1949 and on a roadside at Blind River in 1964, but has not yet been reported for points farther north and west.

The label data on the earlier specimens indicate that the species occurred only in man-made habitats, but records after about 1938 show that it had invaded wet shores and beaches, where it mingled with characteristic native species. The shorelines and flood flats of such rivers as the Ottawa



Map 202. *Digitaria ischaemum.*

and the St. Lawrence are now well occupied and presumably the seeds are distributed by currents, perhaps from lawn clippings dumped into the water. This course of migration is the reverse of that of many native annuals, for example, the species of *Sporobolus*, *Panicum*, and *Cenchrus*, which have moved to man-made habitats from their original shoreline ones.

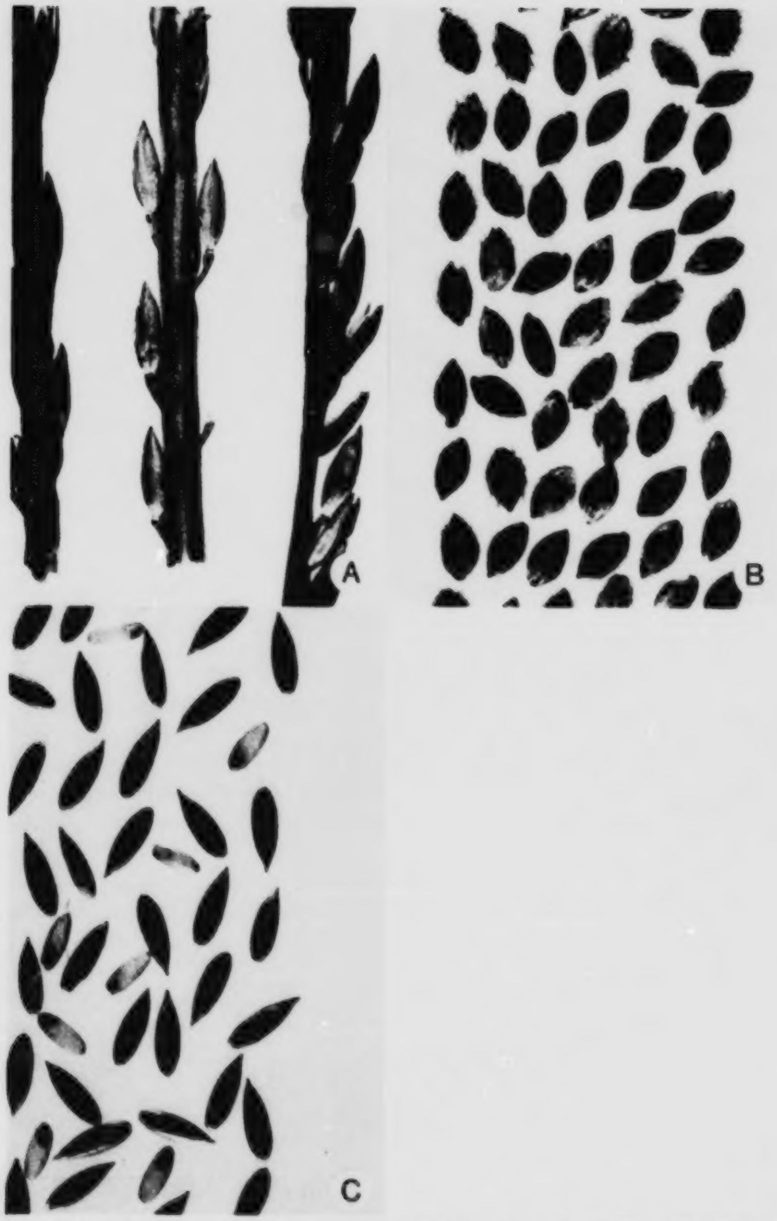


Plate 59. *A*, Spikelets of *Digitaria sanguinalis* (Saunders in 1879); *B*, Florets and caryopses of *D. sanguinalis* (Dore 10350); *C*, Spikelets of *D. ischaemum* (Dore 21107).

67. Leptoloma Chase

Perennials, branching from near the base with numerous brittle culms. Leaf blades flat; sheaths often densely hairy at base, becoming sparsely hairy above; ligule membranous, truncate. Spikelets terminating long slender pedicels. Lower glume minute or absent; upper glume 3- to 5-nerved, almost as long as the 5- to 7-nerved lemma of sterile floret; palea of sterile floret minute, nerveless, or absent. Lemma of fertile floret darkish brown, cartilaginous, flexible, with a thin hyaline margin. Palea of fertile floret similar in texture to lemma, enclosed by it.

1. *Leptoloma cognatum* (Schultes) Chase

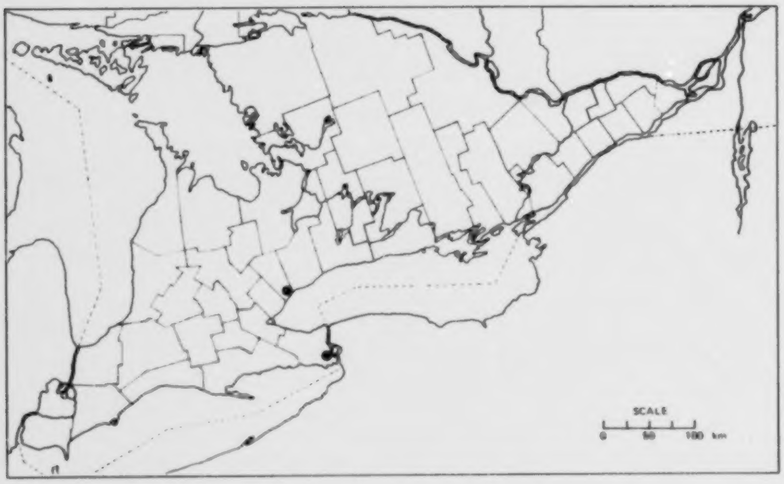
Map 203

fall witch grass

Widespread on dry sandy soil and in sandy fields across the southern and eastern United States, *Leptoloma cognatum* has recently been discovered in a few places in Canada. It was collected in 1971 growing in a prairie relict at Lorne Park, now a district of the city of Mississauga, in 1976 in dry cinder and gravel of railway yards in the Niagara Regional Municipality, and in 1977 along a CPR line in Kent County (Catling et al. 1978). The species has also been reported recently from Rockhouse Point in the Regional Municipality of Norfolk-Haldimand by Zenkert and Zander (1975).

At first sight the species resembles *Panicum capillare*, but in addition to the dark flexible lemma and palea of the fertile floret, *L. cognatum* can be recognized by its generally sparsely hairy leaf sheaths and the longer (2.5–3 mm as against 2–2.5 mm), narrowly elliptic spikelets.

Stenotaphrum secundatum **(Walter) O. Kuntze**—This species, known as St. Augustine grass, is a low-growing, blunt-leaved grass in which the spikelets are sunk into cavities in the rachis. It is used for turf purposes in the southern United States, but it is not hardy in Canada. A form with



Map 203. *Leptoloma cognatum*.

variegated foliage (var. *variegatum* A.S. Hitchc.) is sometimes used as a trailing plant in greenhouses and in hanging floral baskets. This variant is readily propagated by stem cuttings, and flowers are seldom produced.

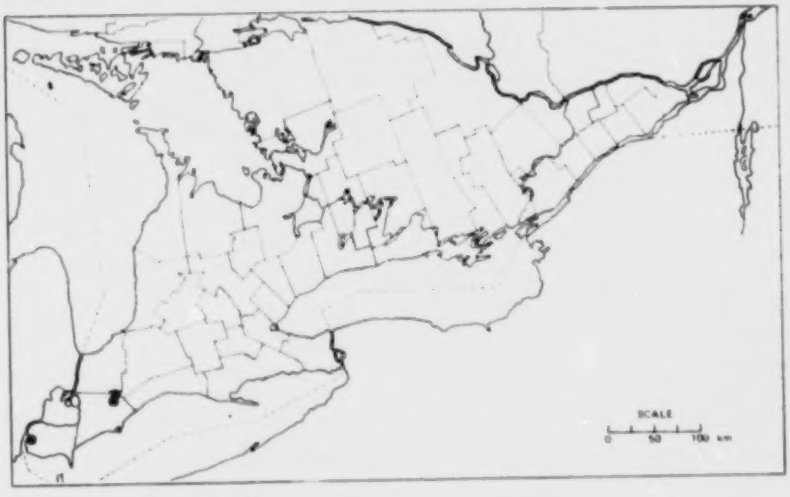
68. Paspalum L.

Perennials, usually with wide, flat leaf blades. Inflorescence of one to many spike-like racemes; spikelets subsessile, often arranged in pairs on one side of the dilated rachis. Lower glume absent; upper glume equal and similar to lemma of sterile floret, wide, rounded at apex, 3-nerved, more or less scarious. Lemma of fertile floret firm becoming more or less ligneous, the margins thickened and inrolled around the similar textured palea.

1. *Paspalum ciliatifolium* Michaux (incl. *P. pubescens* Muhl., *P. stramineum* Nash)

Map 204

The first discovery of a species of *Paspalum* in Canada was made in 1975 when plants of *P. ciliatifolium* were found in the Ojibway Prairie nature reserve at Windsor. In 1976 two other collections were made on open sandy soil near Bothwell and near Thamesville Station in Kent County



Map 204. ***Paspalum ciliatifolium.***

(Crins et al. 1978). *P. ciliatifolium* occurs in open ground and open woods, especially on sandy soil, throughout eastern North America. The species is variable in its leaf pubescence. Two of the collections from Ontario have long hairs on the blades and would be referable to *P. ciliatifolium* var. *muhlenbergii* (Nash) Fernald, recognized by Fernald (1950). The other has less hairy leaves and has been called var. *stramineum* (Nash) Fernald (Crins et al. 1978). These varieties are treated as separate species, *P. pubescens* Muhl. and *P. stramineum* Nash, by Hitchcock and Chase (1951), but numerous intermediate pubescence conditions apparently occur (Mohlenbrock 1972). As a result most recent treatments have not accorded any taxonomic recognition to these variants (*see*, e.g., Gleason and Cronquist 1963; Mohlenbrock 1972).

69. Panicum L.

Mainly native perennial grasses of low to medium height; rhizomes absent (except in *P. virgatum*). Foliage generally pilose, papillose-pilose, or with at least a few hairs on the margins of the sheaths and at the base of the blades; ligule a row of hairs (obsolete in *P. sphaerocarpon*). Panicles lax, open. Spikelets usually ovate or elliptical in outline, dorsally compressed and plano-convex in section, long-pediceled, 2-flowered. Glumes herbaceous, very unequal in length, the lower less than half the length of the upper, the upper as long as the spikelet; awns absent. Lower floret sterile, composed of a large herbaceous lemma and a membranous palea; upper floret perfect with a smooth and hardened lemma enclosing a palea of similar texture.

Panicum is a large genus, particularly characteristic of the warm temperate regions of the world. The genus as represented in North America was revised by Hitchcock and Chase (1910), who recognized nearly 200 species. Many of these have been reduced to varietal rank by Fernald (1921, 1934) and others. Nevertheless, the variation is still not well understood, particularly in the perennial species of subgenus *Dichanthelium* (species 1–13 in the following treatment), which is treated as a separate genus by Gould (1974). In this group autogamy is widespread and has led to the differentiation of numerous rather uniform local populations differing slightly from one another. In other groups apomictic seed production is known to occur (Brown and Emery 1958).

A. Plants annual, recognized by shallow-rooting habit, presence of seedling leaves, absence of stems of previous year, and panicle development in mid to late summer from every stem; spikelets hairless

B. Leaf sheaths hairless; stems somewhat flattened; lower glume not more than one-quarter the length of spikelet, truncate or triangular-tipped; epidermal cell walls papillate .... 14. ***P. dichotomiflorum***

B. Leaf sheaths hairy; stems terete; lower glume usually as much as one-quarter the length of spikelet, acute or acuminate; epidermal cell walls smooth

C. Panicle heavy with spikelets, often drooping; spikelets 4.5–5 mm long; introduced Old World species .... 20. ***P. miliaceum***

C. Panicles erect or diffuse; spikelets less than 4 mm long; native species

D. Mature panicle more than one-half the height of whole plant; peduncle fragile or not at maturity; at least some grains shelling out at maturity leaving glumes on pedicels

E. Panicle narrow, less than one-half as wide as long, few-spikeleted with ascending branches; peduncle not breaking at maturity; axillary pulvini hairless .... 15. ***P. flexile***

E. Panicle as wide as long, diffuse, many-spikeleted; peduncle fragile, breaking readily at maturity; axillary pulvini pilose .... 19. ***P. capillare***

D. Mature panicle less than one-half the height of whole plant, often less than one-third; peduncle not breaking at maturity

F. Branches few, erect or ascending, sparsely spikeleted, forming a narrow panicle; at least some grains shelling out at maturity leaving glumes on pedicels; spikelets long-pointed, 2.3–3 mm long; grain elliptic; anthers 1.5 mm long .... 15. ***P. flexile***

F. Branches numerous, finally wide-spreading, making a diffuse spherical panicle; spikelets falling entire at maturity starting at top of panicle and leaving bare cup-tipped pedicels; spikelets not long-pointed, 1.8–2.5 mm long; grains ovate; anthers 0.6–1 mm long

G. Panicle with relatively few spikelets, usually single or sometimes in distant pairs at ends of straight branches; terminal panicle well-exserted on an erect stem; spikelets about 2 mm long; grains about 1.5 mm long .... 17. ***P. philadelphicum***

G. Panicle with numerous spikelets often in pairs or racemose along flexuous or weak branches; terminal panicle often partly included in sheath at maturity; stem zigzag or reclining when elongated

H. Spikelets 1.8–2.5 mm long, 0.9–1.2 mm wide, usually in pairs at the tips of the branches, long-pediceled; grains about 1.6 mm long by 0.8 mm wide; anthers 0.8–1 mm long; panicles becoming ellipsoid to obovoid, longer than broad .... 16. ***P. gattingeri***

H. Spikelets 1.5–2 mm long, 0.6–0.7 mm wide, 2–6 at the tips of the branches, subsessile to shortly pediceled, forming a small raceme; grains about 1.3 mm long by 0.6 mm wide; anthers 0.6–0.7 mm long; panicle becoming broadly ovoid to deltoid, as broad as long .... 18. ***P. tuckermanii***

A. Plants perennial, firmly rooted, stems of previous year usually present; spikelets hairy or not

I. Leaf blades 3–5 mm wide, 10–20 times as long as wide; stem internodes short and nodes generally hidden within the leaf sheaths; plants growing in dense, fibrous-rooted tufts

J. Glume and sterile lemma prolonged beyond fruit into a short beak; spikelets 3–4 mm long, almost hairless .... 1. ***P. depauperatum***

J. Glume and sterile lemma as long as fruit, blunt; spikelets 2.2–2.8 mm long, sparsely pilose to almost hairless

K. Spikelets 2.8–3.2 mm long, sparsely pilose; basal panicles more numerous than terminal .... 2. ***P. perlongum***

K. Spikelets 2.2–2.8 mm long, sparsely pilose or not; terminal panicles more numerous than basal .... 3. ***P. linearifolium***

I. Leaf blades more than 5 mm wide, or if narrower, not more than 10 times as long as wide; stem internodes well-defined and nodes generally exposed and conspicuous; plants tufted and fibrous-rooted, or growing from a knotty crown

L. Plants not forming a winter rosette of leaves different in shape and texture from the culm leaves; spikelets hairless; leaf blades narrowing to base

M. Plants with scaly rhizomes; stems terete; spikelets about 3 mm long, arranged sparsely in diffuse panicles; lower floret usually staminate .... 21. ***P. virgatum***

M. Plants lacking rhizomes; stems flattened; spikelets about 2 mm long, arranged along one side of the panicle branches on short pedicels; lower floret sterile .... 22. ***P. rigidulum***

L. Plants forming a basal rosette of wintergreen leaves, shorter, wider, usually firmer than the culm leaves

N. Spikelets more than 3 mm long, pubescent; leaf blades rounded or cordate at base; culms arising from a knotty crown in soil below the basal rosette

O. Panicle as wide as long; its branches ± spreading; leaf blades wide-spreading or ascending, ± evenly distributed along culm, or more numerous upwards

P. Leaf blades usually less than 15 mm wide; ligule 0.5–1 mm long hairs of mixed lengths .... 10. ***P. oligosanthes***

P. Leaf blades usually 20 mm or more wide; ligule 0.3 mm long, coarsely membranous, ciliolate .... 13. ***P. latifolium***

O. Panicle longer than wide, its branches ascending or appressed; leaf blades erect, 10–15 mm wide

Q. Leaf blades papillose-hispid, at least on lower surface; pubescence of spikelets sparse and long .... 11. ***P. leibergii***

Q. Leaf blades hairless on both surfaces; pubescence of spikelets dense and short .... 12. ***P. xanthophysum***

N. Spikelets less than 3 mm long, usually 1.2–2.2 mm; plants fibrous-rooted below the basal rosette; leaf blades usually narrowed at base

R. Spikelets hairless, about 2 mm long; leaf blades less than 5 mm wide .... 6. ***P. dichotomum***

R. Spikelets hairy; leaf blades about 10 mm wide or wider

S. Ligule hairs more than 1 mm long

T. Ligule hairs 1–1.5 mm long (not the long hairs of blade base and collar), usually curved; lower glume acute, about one-half the length of spikelet; culms puberulent .... 8. ***P. columbianum***

T. Ligule hairs 2–5 mm long, straight; lower glume blunt, less than one-quarter the length of spikelet; culms variously hairy or hairless, but not puberulent

U. Primary panicles narrowly ellipsoid to narrowly ovoid, one-quarter to one-half as wide as long; lateral spikelets usually equaling or exceeding their pedicels.. ***P. spretum*** (p. 442)

U. Primary panicles rhomboid to broadly ovoid, two-thirds to as wide as long; lateral spikelets usually shorter than their pedicels .... 7. ***P. lanuginosum***

S. Ligule lacking or, if present, its hairs less than 0.5 mm long

V. Spikelets 1.5 mm long, obovoid-spherical; ligule absent or represented by a few hairs in center of area only; panicle branches with viscid-glandular areas .... 9. ***P. sphaerocarpon***

V. Spikelets 2–3 mm long, elliptic; ligule about 0.3 mm long; panicle branches not glandular
  - W. Spikelets 2.5–3.2 mm long; leaf blades usually widest near middle, crowded toward base of culm .... 4. ***P. bicknellii***
  - W. Spikelets 2–2.2 mm long; leaf blades widest near base, dispersed along culm ... 5. ***P. boreale***

1. *Panicum depauperatum* Muhl.

Plate 60, Maps 205–207

depauperate panic grass

Panicum depauperatum is a narrow-leaved and densely tufted species with its base usually buried in the soil and anchored firmly by very slender but tough roots. The stems are erect, 10–30 cm high, and have sparsely branched panicles. These are usually produced in June and the spikelets soon fall off. In August secondary reduced panicles of cleistogamous florets, scarcely visible among the foliage, form in the lower sheaths. In some situations and in unfavorable seasons, only these included inflorescences are produced; in this growth form, which has been called f. *cryptostachys* Fernald, the plants are quite inconspicuous.

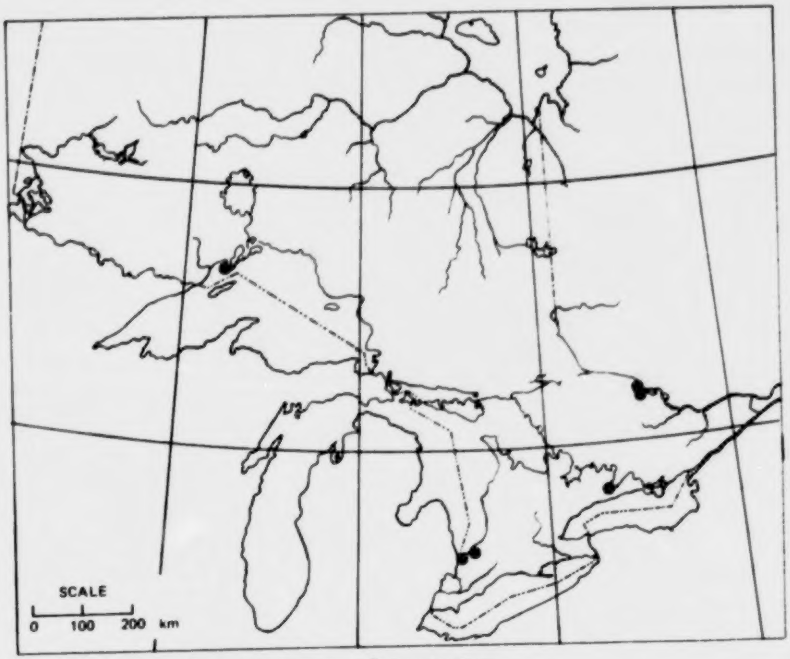
Foliage pilose .... a. var. ***depauperatum***
Foliage hairless, except for cilia on sheaths and at base of blade ..... b. var. ***involutum***

1a. var. *depauperatum*

Var. *depauperatum* is much rarer than var. *involutum* and the leaf blades and sheaths are conspicuously pilose. It is known from Thunder Cape, Lake Superior, Sarnia and elsewhere in Lambton County, in the Oak Hills of Durham County, and in the Petawawa area. In all localities the plants were growing in deep sandy land or on igneous rock. This variety is said to be the prevalent one southward into the United States.

1b. var. *involutum* (Torrey) A. Wood (var. *psilophyllum* Fernald)

Var. *involutum* has hairless foliage or leaves with a few hairs in the ligule region. It is more widespread in Ontario than the densely hairy var.



Map 205. *Panicum depauperatum* var. *depauperatum*.

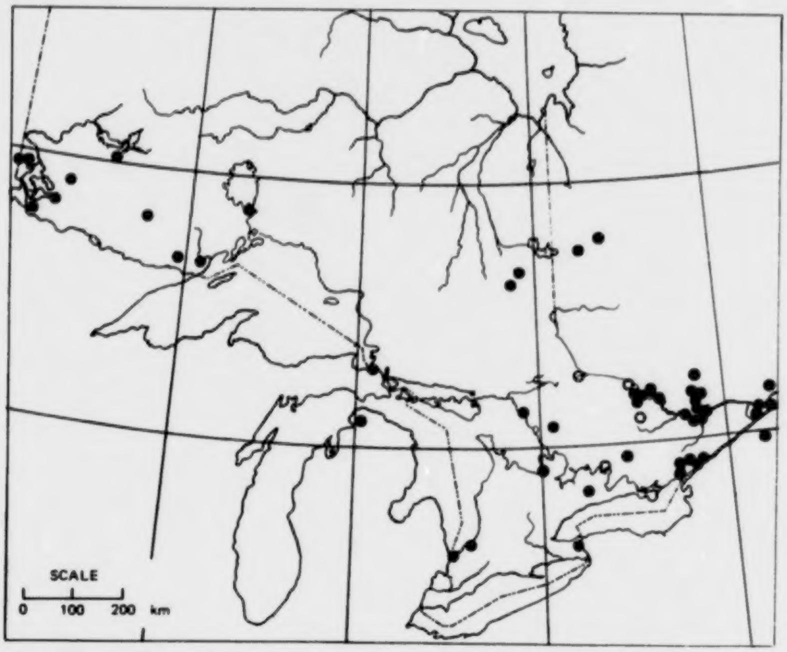
depauperatum and is often abundant on sandy barrens or in thin soil on acidic rocks. When extended panicles are lacking, it may be confused with certain *Carex* species with a similar growth habit. It is still only known from a limited number of localities, and literature records (for the species as a whole) for Wellington County (Stroud 1941), the Toronto area (Faull 1913), and Point Pelee (Dodge 1914) are not substantiated by specimens.

Voss (1966) has shown why the epithet *involutum* must replace *psilophyllum* proposed by Fernald.

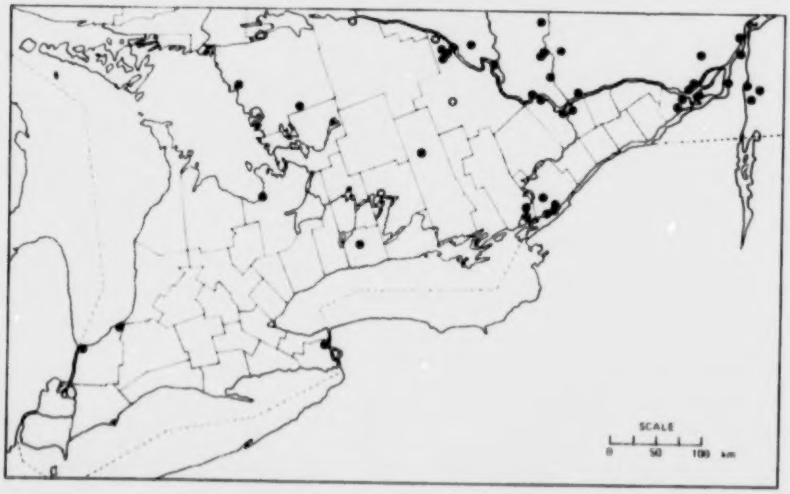
2. *Panicum perlongum* Nash

Plate 60, Map 208

Panicum perlongum is distinctive with its long-exserted, slender panicle of short-pediceled, blunt spikelets and appressed hairy dorsal leaf surfaces. In the cleistogamous panicles, the ovate spikelets are closely packed in a row. The species is frequent in the midwestern United States, but extends into Canada only in southern Manitoba and westernmost Ontario (Ingolf),

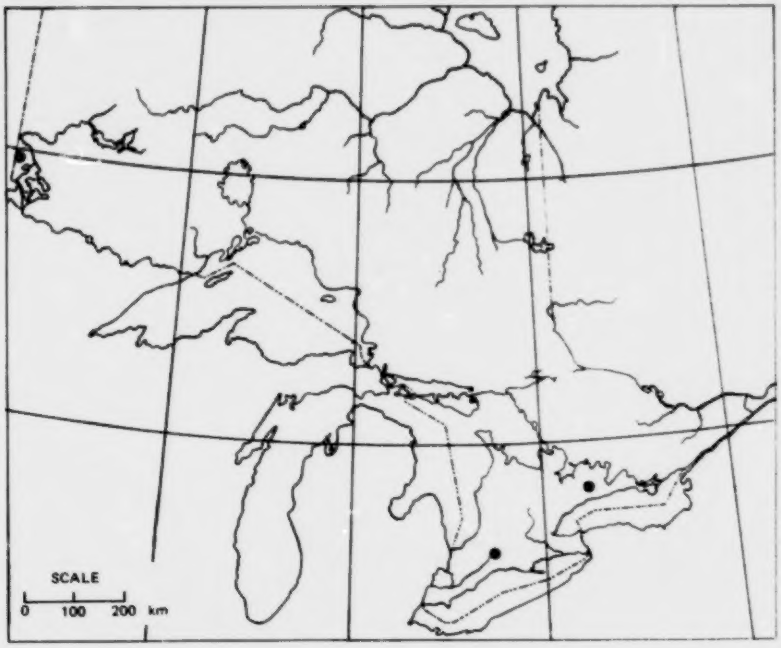


Map 206. *Panicum depauperatum* var. *involutum*. For detail of distribution in southern Ontario, see Map 207.



Map 207. *Panicum depauperatum* var. *involutum*. Detail of distribution in southern Ontario; for general distribution in Ontario, see Map 206.

with disjunct occurrences in southern Ontario at London and at Pontypool, Victoria County. At this last site it is abundant on deep sand deposits in old clearings and is associated with *P. depauperatum* var. *involutum*.



Map 208. *Panicum perlongum*.

This taxon should possibly be treated as a variety of the previous species, as *P. depauperatum* var. *perlongum* (Nash) Boivin.

3. *Panicum linearifolium* Scribner

Plate 60, Maps 209–212

narrow-leaved panic grass

A narrow-leaved, tufted species very much like *P. depauperatum* in habit of growth, *P. linearifolium* is distinguished by its small spikelets and somewhat larger panicles. The two species grow in similar habitats, but *P. linearifolium* is much more widespread and abundant in Ontario.

Two varieties are recognizable. Their extremes are conspicuously different in pubescence and can easily be picked out when found in the same locality; very few individuals of intermediate hairiness occur. In Ontario the two varieties are represented by about equal numbers of collections (57 vs. 64), but when their distribution is plotted they reveal some local exclusiveness and some differences in total range.

Foliage pilose; spikelets sparsely pilose .... a. var. ***linearifolium***
Foliage essentially hairless, with only a few long cilia generally along sheaths and at base of blade; spikelets almost hairless .... b. var. ***werneri***

3a. var. *linearifolium*

Var. *linearifolium*, which has conspicuously long-hairy leaf sheaths and blades, is the more common in the southwestern counties of Ontario. It is also the only one found on gravelly moraine near Prescott. Elsewhere in eastern Ontario, the two varieties are sometimes found together.

3b. var. *werneri* (Scribner) Fernald (*P. werneri* Scribner)

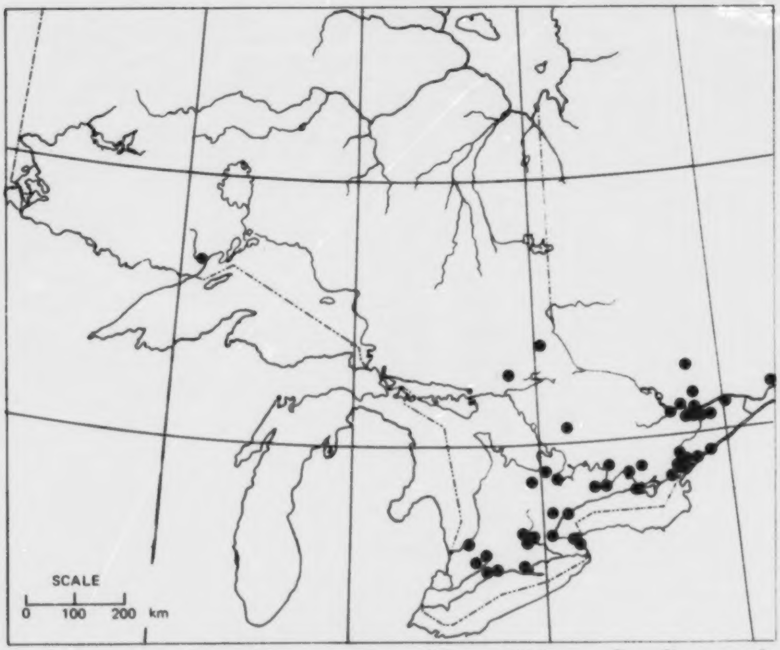
Var. *werneri*, with hairless foliage or just a few cilia at the base of the leaf blade, is the prevalent variety in the sandy and rocky area of Renfrew County and in northwestern Ontario adjacent to Minnesota and Manitoba. There is a single, apparently isolated collection from Caistorville, Niagara Regional Municipality, but otherwise the variety is not known in southwestern Ontario. At Mille Roche (a site now flooded by the St. Lawrence Seaway) and at Spragge, Algoma District, specimens come from railroad embankments, and the plants are likely to have been introduced. This is possibly also the case at other localities.

4. *Panicum bicknellii* Nash

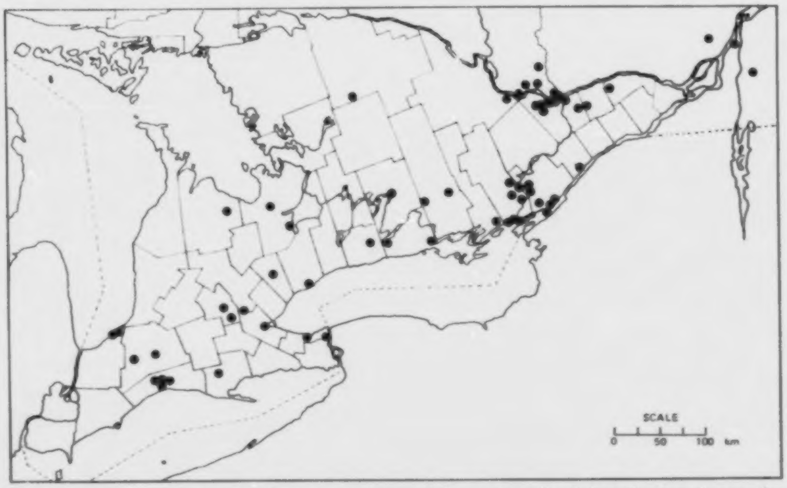
Map 213

Records of *Panicum bicknellii* from Ontario are few, widely scattered, and somewhat confusing. It has been suggested (Fernald 1950) that the plants referable to this species are in fact of hybrid origin.

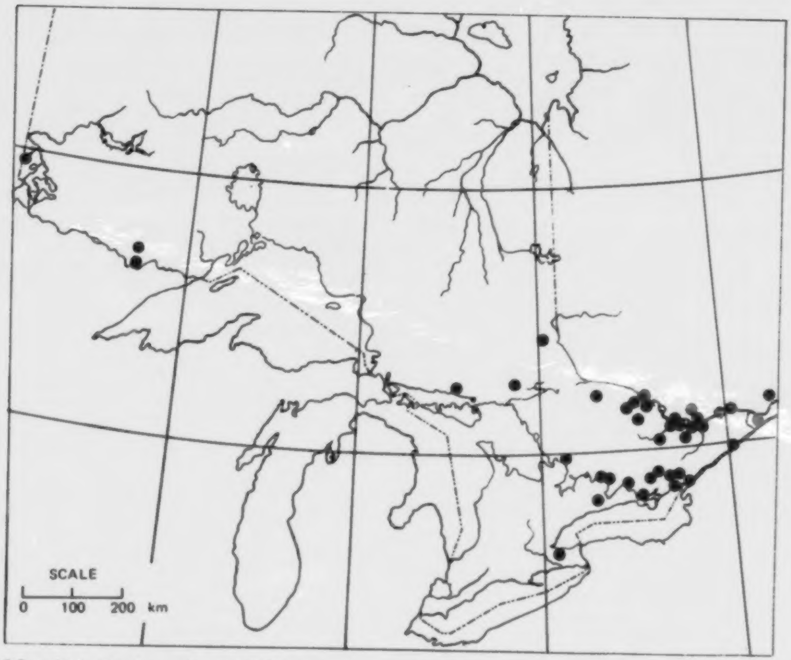
Spikelets 2.3–2.8 mm long; primary leaves 3–8 mm wide; spring plants bluish green .... a. var. ***bicknellii***
Spikelets 2.9–3.2 mm long; primary leaves 8–12 mm wide; spring plants yellowish green .... b. var. ***calliphyllum***



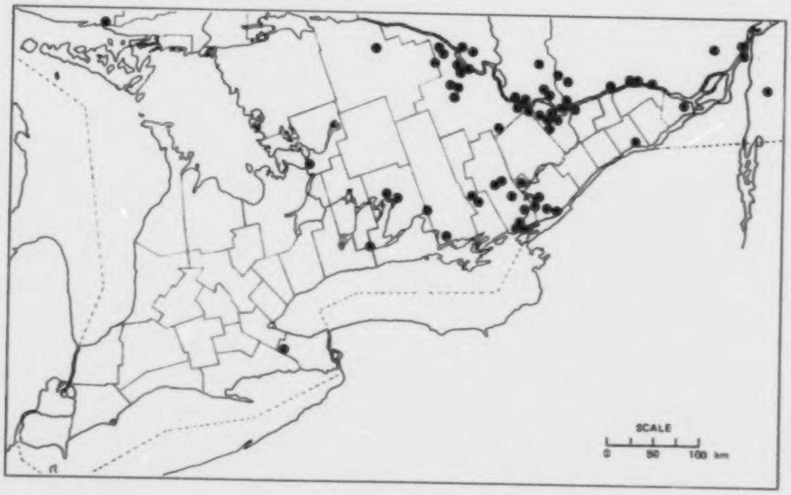
Map 209. ***Panicum linearifolium*** var. ***linearifolium***. All known Canadian records from the area covered by the map are plotted. For detail of distribution in southern Ontario and adjacent Quebec, see Map 210.



Map 210. ***Panicum linearifolium*** var. ***linearifolium***. Detail of distribution in southern Ontario; for general distribution in Ontario and western Quebec, see Map 209. All known Canadian records from the area covered by the map are plotted.



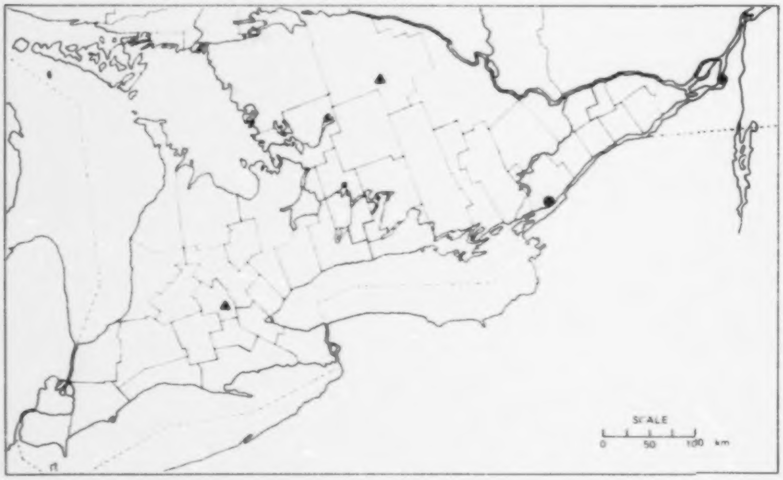
Map 211. ***Panicum linearifolium*** var. ***werneri***. All known Canadian records from the area covered by the map are plotted. For detail of distribution in southern Ontario and adjacent Quebec, see Map 212.



Map 212. ***Panicum linearifolium*** var. ***werneri***. Detail of distribution in southern Ontario; for general distribution in Ontario and western Quebec, see Map 211. All known Canadian records from the area covered by the map are plotted.

4a. var. *bicknellii*

The typical variety, var. *bicknellii*, is represented by a specimen in the U.S. National Herbarium labeled "Plants of Canada. E. P. Bicknell. Rockport. August 25, 1905." In their monograph of the genus, Hitchcock and Chase (1910) cite this specimen under New York State, not Canada. However, as there is no Rockport in New York State, we must assume from other collections by Bicknell gathered in the Thousand Islands area in the late summer of 1905 that his specimen was from Rockport in Leeds County near the United States border, rather than from New York State. A rather distinctive species, *P. bicknellii*, has not been collected subsequently in that area. However, a specimen of var. *bicknellii* was collected by Rolland-Germain in 1936 in Quebec at Longueuil, opposite Montreal, where it was growing on the railroad in soil said to have been transported from Sorel, farther down the St. Lawrence River.



Map 213. *Panicum bicknellii* var. *bicknellii* (•) and var. *calliphyllum* (▲).

4b. var. *calliphyllum* (Ashe) Gleason (*P. calliphyllum* Ashe)

Griscom (1931) states that this taxon has been collected in "Ontario, once." This brief reference must refer to a single collection by Herriot consisting of several replicates variously annotated as having been collected in dry woods at Galt (Cambridge) on June or July 20, 1910 or 1911. The variety was found again in Ontario in 1972 by Brunton and Pratt, but at the eastern end of Algonquin Park far removed from Cambridge. This collection lends some support to the suggestion that the taxon is in fact a sporadically formed hybrid; in this case *P. xanthophysum* might be one parent.

5. *Panicum boreale* Nash

Plate 61, Maps 214 and 215

northern panic grass

Plants of *Panicum boreale* are usually a bright green color with flat cordate-based blades about 1 cm wide, papillose-ciliate toward the base, and with a ligule about 0.5 mm long. The culms and the middle and upper leaf sheaths are hairless except for the pilose-fringed margins of the upper leaf sheath. The spikelets are elliptic, 2.0–2.2 mm long, long-pediceled in rather sparse panicles.

Leaf blades and collar hairless .... a. var. ***boreale***
Leaf blades densely hairy; collar puberulent .... b. var. ***michiganense***

5a. var. *boreale*

The typical variety of *P. boreale* is rather common in the Maritime Provinces reaching westward to the Ottawa Valley. It is represented elsewhere in Ontario only by scattered collections such as those from Windsor, the banks of the Serpent and Mississagi rivers along northern Lake Huron, along Root Creek at Sault St. Marie, and at Lac Lacroix in Quetico Park near known stations in Minnesota.

5b. var. *michiganense* Farwell

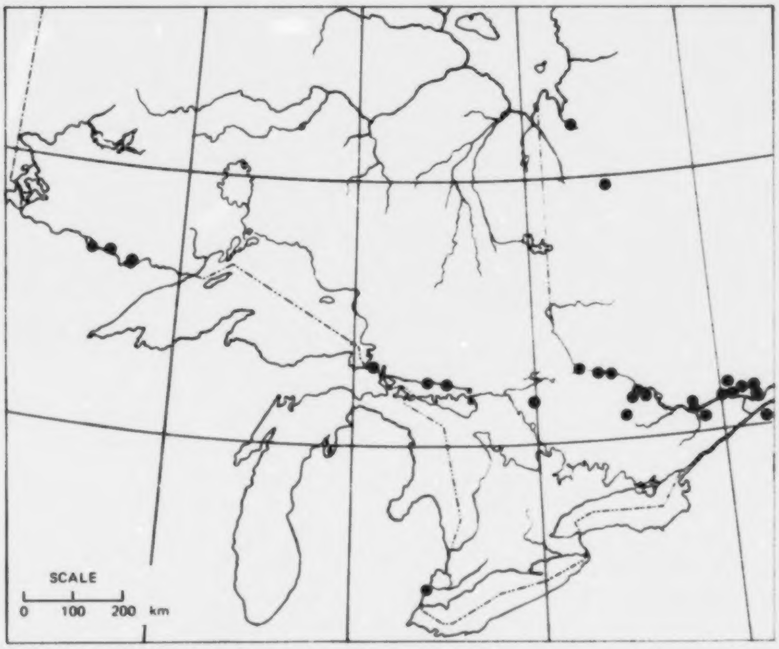
The slender ascending hairs on the leaf blades of var. *michiganense* are about 0.7 mm long and have a density of about 10 hairs/mm^2. The variety is not present in the Maritime Provinces and is known in Ontario only along the Ottawa River above Ottawa, in southern Algonquin Park, at Haliburton, at Otter Lake in Frontenac County, and at Squirrel Island in Lake St. Clair not far from the type locality at Detroit, Michigan. This interesting variant may be the result of hybridization between another species and *P. boreale* in an area where that species is rare and at the limit of its range.

6. *Panicum dichotomum* L.

Map 216

forked panic grass

The characteristic features of *Panicum dichotomum* are its small (1.8–2 mm), smooth, elliptic spikelets with the upper glume blunt and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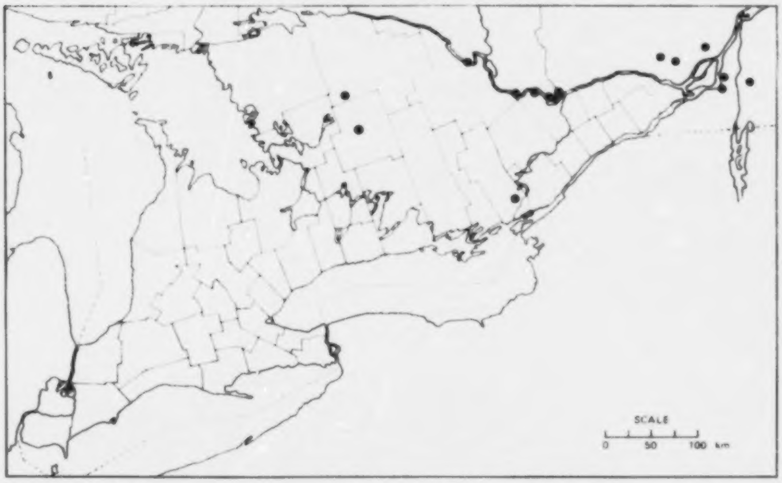
Map 214. *Panicum boreale* var. *boreale*. All known Canadian records from the area covered by the map are plotted.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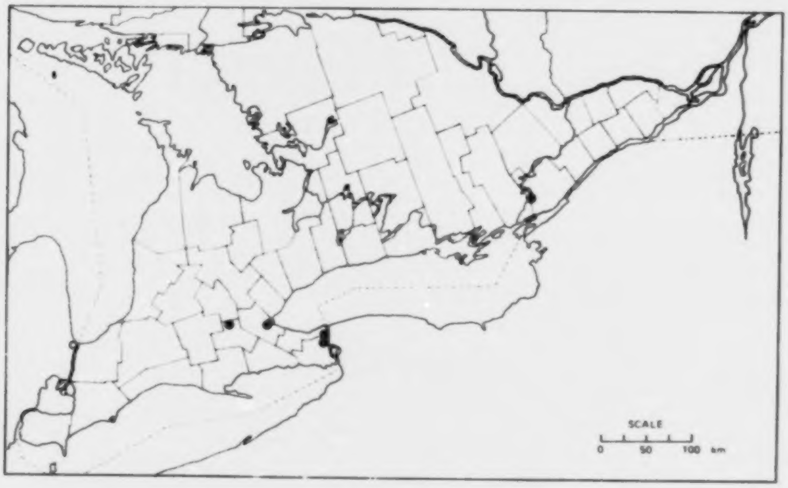
Map 215. *Panicum boreale* var. *michiganense*. All known Canadian records from the area covered by the map are plotted.

exposing the tip of the whitish fertile lemma. The panicle branches and axis are finely undulate, the leaf blades are hairless except for the puberulent collar, and the ligule is short (about 0.3 mm) and densely hairy.

The species is very rare. In the western Lake Ontario area where the records from the province are concentrated, it is perhaps approaching extinction. It was collected in 1892 in grassy woods at Niagara Falls, in 1902 along the electric railway at Queenston Heights, and in 1902 or 1903 in dry woods at Spottiswood Lake south of Galt (Cambridge). The only record in more recent years from this area is that from Hamilton in 1954. However, the species was detected in 1969 near Jones Falls, Leeds County, where it was growing abundantly in a localized pitch pine stand on the cliffs of Sand Lake.



Map 216. *Panicum dichotomum.*

Many old specimens labeled *Panicum dichotomum* have been revised to some of the other species into which the group has been segregated; consequently most of the early literature reports must be neglected. Those from Toronto (Faull 1913), Point Pelee (Dodge 1914), and Lambton County (Dodge 1915) are not supported by specimens and therefore fall into this category. That for Waterloo County (Montgomery 1945) is presumably based on Herriot specimens labeled simply "Galt." These are in fact the collection referred to above as coming from Spottiswood Lake, which is in Brant County.

7. *Panicum lanuginosum* Elliott

Plate 61, Maps 217–222

hairy panic grass

In the treatment adopted here, *Panicum lanuginosum* is considered in a broad sense that includes several of the species recognized by Hitchcock and Chase (1910) in their *Lanuginosa* and *Spreta* groups. This reflects the proposals made by Fernald (1921, 1934). The species comprises plants of low to medium size (generally 10–20 cm high) with long ligules (2–5 mm) of straight hairs and rather small (1.3–2.1 mm) hairy spikelets. These have a blunt, soft, short lower glume, one-third or less the length of the spikelet. Fine, often papillose-based hairs may cover all the foliage, the culm, and the panicle axis, or occur only as marginal cilia on the lowermost sheaths and the blade base. In late summer the basal rosette renews its firm leaves, which remain green over winter and are held somewhat insecurely in the soil by fine roots. No rhizomes are present.

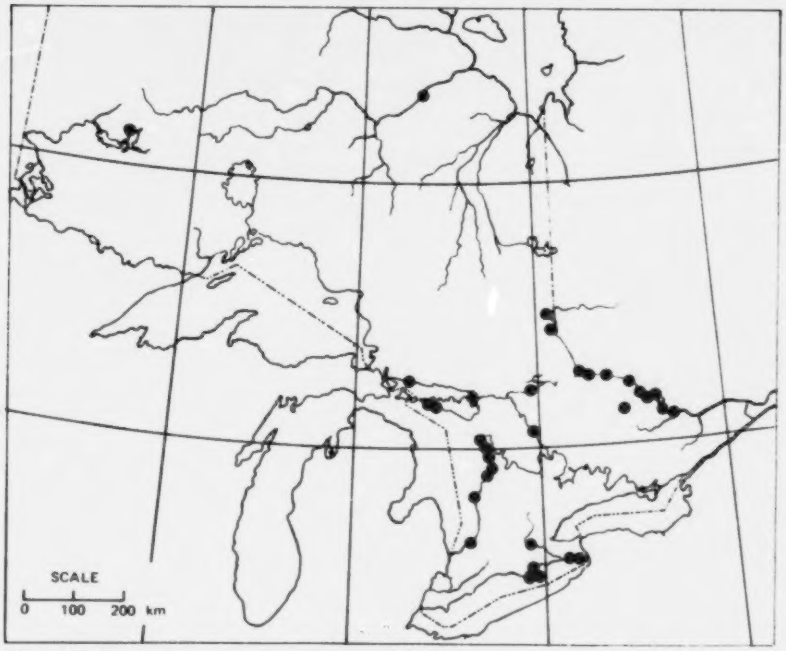
The varieties recognizable by the size of the spikelets and the nature of the pubescence show rather definite geographic and ecological patterns in Ontario; these are even more marked if the total range is considered. The category of *varietas* is preferred to that of species because of the intergradation shown in these characters. The extensive autogamy allows distinctive local populations to be formed and makes any taxonomic treatment difficult to apply.

- A. Spikelets 1.3–1.5 mm long
  - B. Leaves hairless, except for cilia at base of blade and hairs on lower sheaths; culms and panicle axes hairless .... a. var. ***lindheimeri***
  - B. Leaves pilose on both surfaces; sheaths, culms, and panicle axes sparsely to densely pilose .... b. var. ***implicatum***
- A. Spikelets 1.6–2.1 mm long
  - C. Leaves and culms hairless; plants bright green .... d. var. ***septentrionale***
  - C. Leaves and culms conspicuously hairy
    - D. Pubescence on lower side of leaf blades rather short, appressed, on upper side sparsely long-pilose or almost lacking; plants usually purple-tinged .... c. var. ***fasciculatum***
    - D. Pubescence on both sides of blades of uniformly dense, long (2–4 mm), fine hairs, horizontally spreading; plants usually dull green .... e. var. ***praecocius***

7a. var. *lindheimeri* (Nash) Fernald (*P. lindheimeri* Nash)

The plants of var. *lindheimeri* are smooth leaved with small spikelets, but are similar to those of var. *fasciculatum* in their upright growth habit and purple coloration.

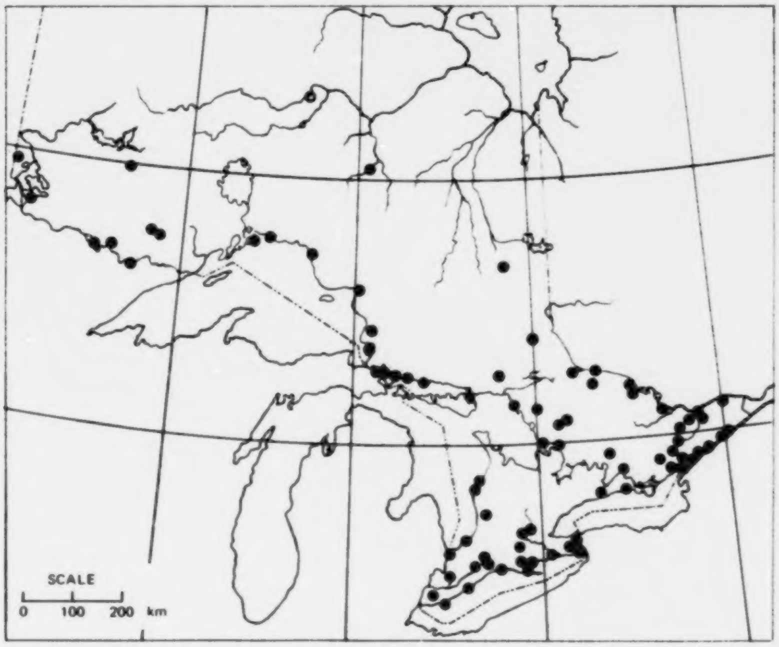
The variety is abundant along the Lake Huron shore where it has been collected numerous times, and it is apparently the only variant found on the Bruce Peninsula. It is also frequent on the upper Ottawa River as far as Lake Temiscaming, and there are a few outlying localities in the far north and west, for instance, on the Albany River. The variety does not extend to the provinces to the east and west. The grass is characteristic of flood shores, developing on the higher beaches and in flats between ridges, irrespective of the nature of the substrate, being found on sand, gravel, limestone flat or igneous rock. The characteristic features seem to be genetically determined and not simple environmental modifications. Ecologically, it seems adapted to periodically inundated habitats.



Map 217. *Panicum lanuginosum* var. *lindheimeri*.

7b. var. *implicatum* (Scribner) Fernald (*P. implicatum* Scribner)

Var. *implicatum* is usually noticeable as low-growing, pale green, weak plants with the appearance of having soft foliage and straggly stems and inflorescences. The plants are covered with long, slender but fairly sparse hairs. This is the widespread variant in Canada and is particularly abundant in the east. In Ontario it is common across the southern half of the province, but apparently absent in the area from the York region to the Bruce Peninsula and Manitoulin, but it is found at scattered localities northward to Martin Falls on the Albany River.



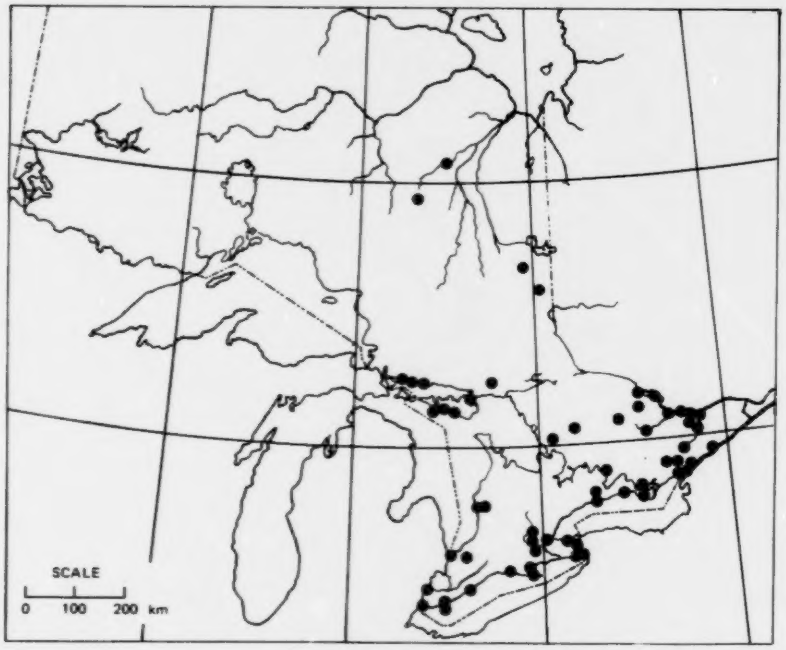
Map 218. *Panicum lanuginosum* var. *implicatum*.

The variety seems to have been confined originally to natural openings on rocky outcrops, dry sandhills, and eroding slopes, but since European settlement it has spread to artificial clearings and thrives in old pastureland, particularly on sandy or impoverished soil where other herbs fail to form dense stands. It cannot compete on good pasture and field soil and is not found on shores. Reports and records of *P. subvillosum* Ashe in Ontario all appear to refer to this taxon or the following one.

7c. var. *fasciculatum* (Torrey) Fernald (*P. huachucae* Ashe, *P. languidum* A. S. Hitchc. & Chase, *P. tennesseense* Ashe, pro parte)

In addition to the features mentioned in the key, var. *fasciculatum* possesses a more upright habit of growth than var. *implicatum*, with stems and leaves of a firmer and more rigid texture. It also develops a purplish coloration throughout when growing in full sunlight. In these features it resembles var. *lindheimeri*, but contrasts conspicuously in the pubescence of its sheaths and stems.

The variety is found scattered across the southern half of the province and indeed across Canada, but it is apparently absent in Ontario from west of Sault Ste. Marie to the Manitoba border.



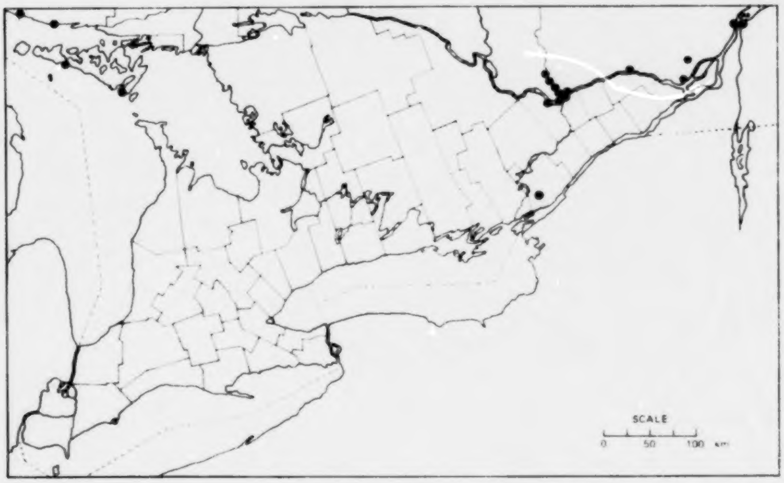
Map 219. *Panicum lanuginosum* var. *fasciculatum*.

It grows in a variety of habitats and soils, often on grassy banks skirting beaches, but more vigorously on sandy roadsides. It is not, however, usually found in pastures and fields, or on beaches themselves.

7d. var. *septentrionale* (Fernald) Fernald (*P. tennesseense* Ashe, pro parte)

Var. *septentrionale* is hairless over most of its surface, and is usually strikingly bright green in its overall color. Although the plants are often few-stemmed and low, the spikelets and basal rosette leaves are somewhat larger than in most other variants. It may possibly represent a higher polyploid segregate or have arisen by hybridization with *P. boreale*.

The variety is abundant along the Ottawa River in the Ottawa area (and lower Gatineau River in Quebec province), from where it ranges eastward, sparsely, to Nova Scotia. It is also known from the igneous rock shore of Charleston Lake, Leeds County, and at scattered sites on Manitoulin Island and the adjacent north shore of Lake Huron. It seems to prefer moist floodshore habitats.

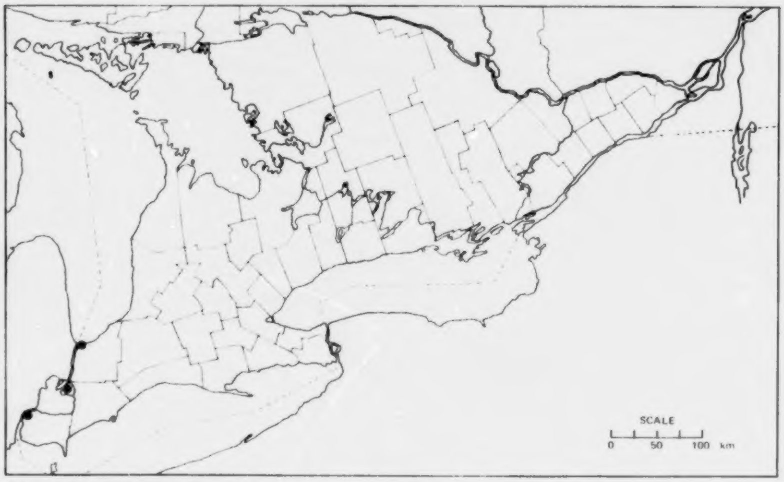


Map 220. *Panicum lanuginosum* var. *septentrionale*. All known Canadian records from the area covered by the map are plotted.

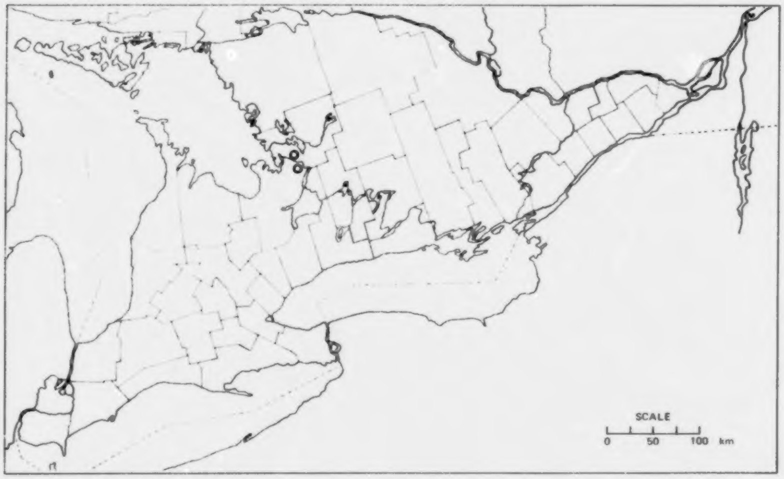
7e. var. *praecocius* (A. S. Hitchc. & Chase) Dore (*P. praecocius* A. S. Hitchc. & Chase)

Var. *praecocius* is distinctive in its conspicuous pubescence of long (2–4 mm), soft hairs over the whole plant. These are papillose-based and spread horizontally except at culm nodes where they are somewhat reflexed and appear as a definite fringe. The spikelets are long for the species, 1.7–2.0 mm, and in this respect the variety grades into *P. villosissimum* Nash (it might also be treated as a variety of *P. lanuginosum*). It has larger spikelets and occurs on dry sandy soil in the eastern United States.

Frequently collected on Squirrel Island, an alluvial flat in the St. Clair River delta that supports a prairie flora unusual for Canada, var. *praecocius* is also present in similar prairie vegetation at Sarnia and Windsor. The plants tend to form elongated, rather slender culms with much of the internode exposed. Similarly, slender branches are developed early and these support it among the taller densely growing herbs with which it is associated.



Map 221. ***Panicum lanuginosum*** var. ***praecocius.***



Map 222. ***Panicum spretum.***

***Panicum spretum* Schultes**—This is a very similar species of wet peat and sand, widely distributed in eastern North America. It has recently been reported for the first time in Ontario (Catling et al. 1978) from Matchedash Lake near Orillia, Simcoe County, where it was growing with *P. lanuginosum* var. *implicatum*, and from Wood township, Muskoka District. It is distinguishable by the narrower panicle (*see* key). Plants of *P. spretum* have glabrous culms apart from fine hairs on some of the basal sheaths.

8. *Panicum columbianum* Scribner

Plate 61, Maps 223 and 224

Columbia panic grass

Spikelets 1.7–2.1 mm long; plants usually about 20 cm high ....a. var. ***siccanum***
Spikelets 2.2–2.4 mm long; plants usually 20–50 cm high ....b. var. ***commonsianum***

8a. var. *siccanum* (A.S. Hitchc. & Chase) Boivin (*P. tsugetorum* Nash)

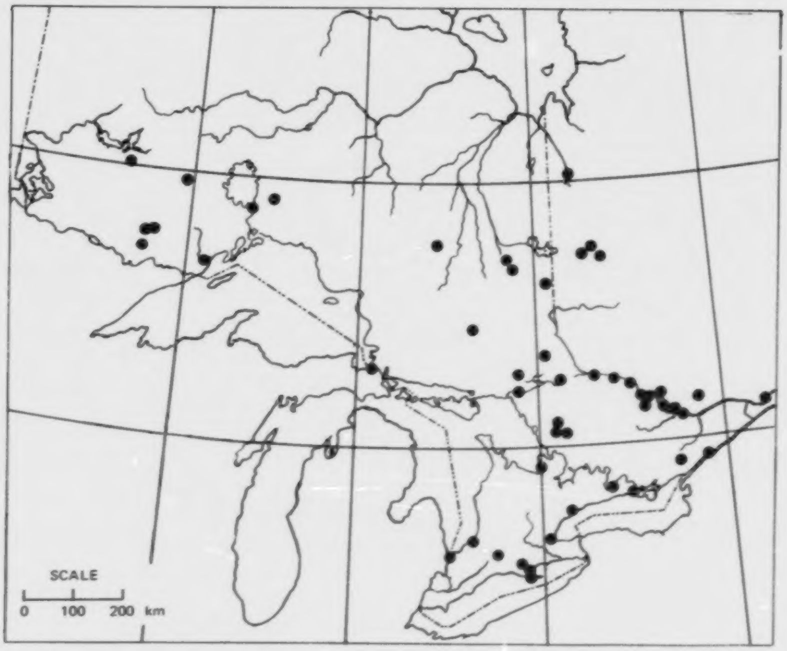
Panicum columbianum var. *siccanum* superficially resembles some members of the *P. lanuginosum* group, especially var. *fasciculatum* from which it may be recognized in the field by its somewhat lower stature and its smaller, fewer-flowered panicles. It differs from all variants of *P. lanuginosum*, moreover, in three clear-cut features that require closer examination: the short (0.5–1.5 mm) curved hairs of the ligule, which are often obscured by the longer straight hairs of the blade base; the acute lower glume about one-third as long as the spikelet; and the fine puberulence covering spikelets, culm, panicle axis, and the lower side of the leaf blades, again often obscured by longer hairs.

Var. *siccanum* ranges widely from southern Quebec to southeastern Manitoba. It is concentrated in Ontario along the sandy shores of the Ottawa River (e.g., at Constance Bay) as far north as Mattawa, then across to Lake Nipissing and French River. It also occurs on sands in Norfolk County, at Sarnia, Grand Bend, and Wasaga, and on sandy soil on rocks northward from Sudbury into Cochrane and Thunder Bay districts. *Panicum columbianum* var. *columbianum*, into which var. *siccanum* grades, has smaller spikelets and does not occur in Ontario, but is found to the southeast of the range of var. *siccanum*.

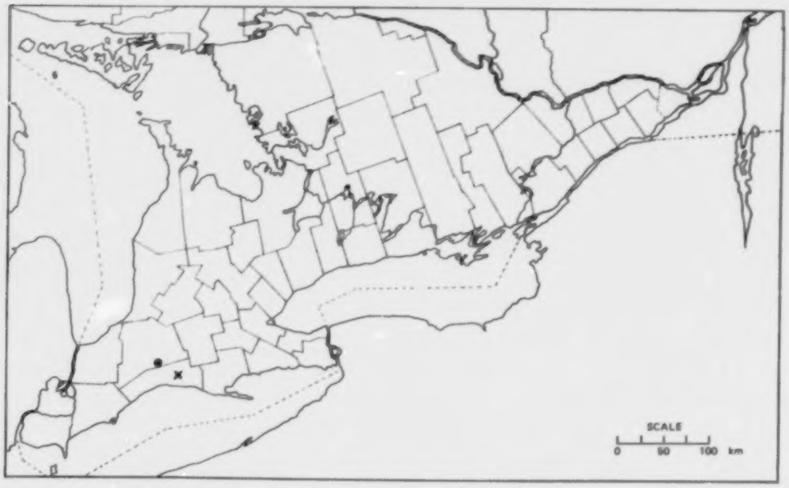
8b. var. *commonsianum* (Ashe) Dore (*P. commonsianum* Ashe)

Although often kept as a separate species, var. *commonsianum* is similar to other varieties except that it is larger in most respects, with spikelets 2–2.4 mm long.

It is known in Canada from only one locality, a "dry sandy clearing" 16 km southwest of London in association with *P. oligosanthes*. The possibility exists of its local origin as a result of hybridization between that species and var. *siccanum*. It is reported as abundant on Presque Isle on the south side of Lake Erie in Pennsylvania (Pohl 1947, p. 582), which is the next nearest occurrence. Another specimen, intermediate between var. *commonsianum* and var. *siccanum* in stature and size of spikelets, has been collected southeast of London in Malahide Township, Elgin County.



Map 223. *Panicum columbianum* var. *siccanum*. All known Canadian records from the area covered by the map are plotted.



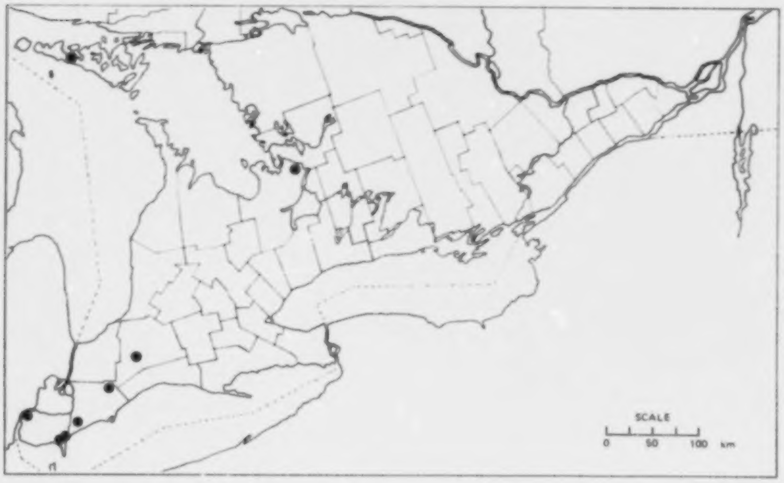
Map 224. *Panicum columbianum* var. *commonsianum*. A solid circle (•) indicates a record of plants typical of the variety and a cross (**X**) one of plants intermediate between var. *commonsianum* and var. *siccanum*.

9. *Panicum sphaerocarpon* Elliott

Map 225

Plants of *Panicum sphaerocarpon* are slender stemmed, usually with three lanceolate bright green blades about 10–15 mm wide. These are hairless except for the prominent and papillose based cilia on the white hyaline margin toward the base. The sheaths have shorter marginal hairs and the ligule is absent. The spikelets are broadly ovate to spherical, 1.5–1.6 mm long, and microscopically pubescent. Another characteristic feature is the presence of elongate viscid patches on the panicle branches; these are best detected by the dirt adhering to them.

The species is rare in Canada, known only from the southwestern counties of Ontario, and from one locality in Simcoe County (Catling et al. 1978). It has been found at Sarnia, in sandy open woods south of Windsor, in wet sandy land near Wheatley east of Leamington, and at Chatham.



Map 225. *Panicum sphaerocarpon.*

A specimen collected at Caradoc, Middlesex County, in 1891 is referable to the closely related *P. polyanthes* Schultes although it might be better treated as a variety of *P. sphaerocarpon.* It differs in its more leafy growth and its longer, rather narrower panicle. This specimen seems to represent a temporary introduction that has not persisted. The species occurs naturally only in the southern parts of the adjacent states.

10. *Panicum oligosanthes* Schultes

Plate 62, Maps 226 and 227

few-flowered panic grass

In *Panicum oligosanthes* the stems are somewhat strict, generally 20–30 cm high, becoming leafy at the top, and sprawling outward from the central clump. The culm internodes are purplish, often long-exerted from the sheaths. The leaf blades are hairless above and sometimes also beneath, but the margins at the base and the sheaths are papillose-pilose; they bear ligules 0.5–1.5 mm long of separate white hairs of varied lengths. The spikelets are rather long (3.2–3.6 mm) with short soft pubescence.

In Ontario the species shows some variation in stature, density, and direction of pubescence, and in the size of the spikelets. This variation is within the limits expected for a single species, and the combinations of characters used to distinguish separate taxa (species by some, varieties by others) within the complex are not consistent. Use of one of the characters, the pubescence of the lower surface of the leaf blades, permits two groups to be recognized, which correspond to some extent with existing taxa; they are tentatively referred to by Fernald's (1951) varietal names.

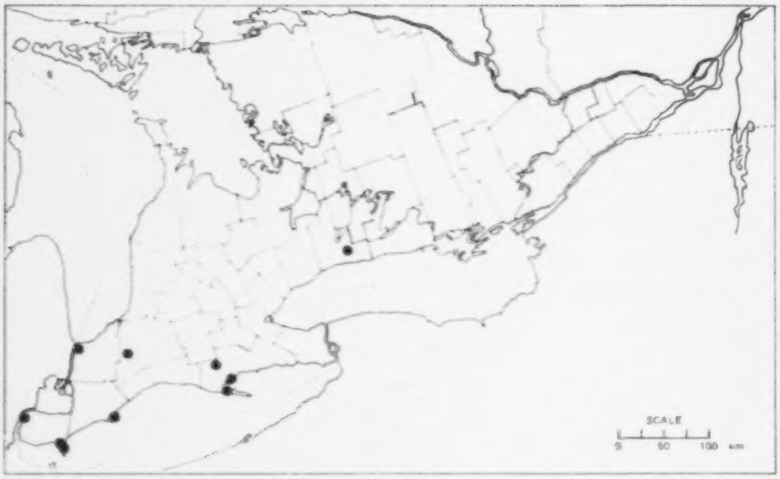
Lower surface of leaf blades densely hirtellous .... a. var. ***oligosanthes***
Lower surface of leaf blades hairless .... b. var. ***scribnerianum***

10a. var. *oligosanthes*

This group is represented by numerous collections from the sandy land in the southern part of the Regional Municipality of Haldimand-Norfolk, where the other variant has not been found. Elsewhere var. *oligosanthes* occurs sparsely with the other variety in the southwestern counties but does not appear to occur at Grand Bend, Squirrel Island, or along the beaches at the eastern end of Lake Erie. A localized occurrence on a sandy roadside near Pontypool, Durham County, may be an introduction arising from the planting of forest nursery stock on the sandy derelict land in the area.

10b. var. *scribnerianum* (Nash) Fernald (*P. scribnerianum* Nash)

Plants with the hairless leaf blade character of var. *scribnerianum* are abundant in the open sandy woods around Grand Bend, Sarnia, Windsor, Point Pelee, and Rondeau Park, in the alluvial prairie on islands of the St. Clair River delta, on sandy land in Middlesex and Elgin counties (but not in the Regional Municipality of Haldimand-Norfolk), and along the beaches of eastern Lake Erie. Var. *scribnerianum* is the more widely dispersed variety in the northern part of the United States.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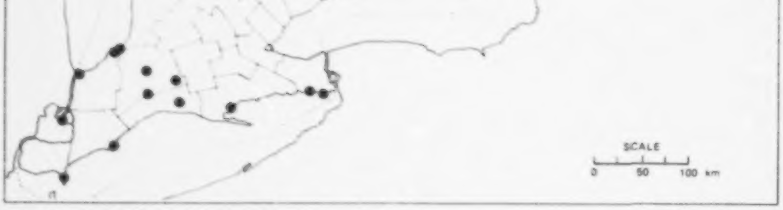
Map 226. *Panicum oligosanthes* var. *oligosanthes*.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Map 227. *Panicum oligosanthes* var. *scribnerianum*.

11. *Panicum leibergii* (Vasey) Scribner

Plate 62, Maps 228 and 229

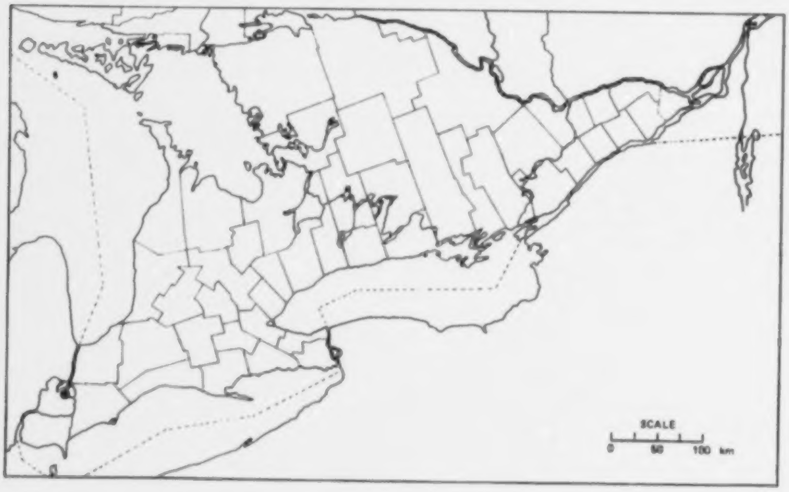
Leiberg's panic grass

Panicum leibergii is distinctive among the large-spikeleted species in that its spikelets are pilose with particularly long (about 0.8 mm), fine, flexuous, sparse hairs, and in its short (0.3 mm or less) ligule of dense hairs fused into a membrane. It is also characterized by its papillose-hispid foliage, by its undulate, almost toothed, blade margin, and by the harsh papillose cilia. The stems, which are usually firm and erect, arise from a coarse knotted crown in the soil.

Both surfaces of the leaf blades hispid .... a. var. ***leibergii***
Upper surface of the leaf blades hairless or almost so.......................... b. var. ***baldwinii***

11a. var. *leibergii*

Var. *leibergii* is known in Ontario only from Squirrel Island at the mouth of St. Clair River, where it is found as a component of the prairie-like vegetation that extends southwestward into the United States. The variety has also been found on the adjacent Herson Island in Michigan.



Map 228. *Panicum leibergii* var. *leibergii.*

11b. var. *baldwinii* Lepage

Var. *baldwinii* is lower growing than the typical variety, as well as being essentially hairless on the upper surface of the leaf blade. In general appearance it resembles *P. xanthophysum*, but it is distinct in its papillose-pubescence and long spikelet hairs. It is known from the rocky shores of the Missinaibi River at three points below Mattice (the type locality) and at Kapuskasing where it was found in the shoreside town park and suspected of being introduced (Baldwin 1958); this suspicion might be extended to the Mattice stands. Its occurrence at Rainy River is linked to its range from the southern Canadian prairies and adjacent American states where the varieties appear to intergrade.

12. *Panicum xanthophysum* A. Gray

Plate 62, Map 230

yellow panic grass

Panicum xanthophysum is distinguishable from the other large-spikeleted species by its slender stems, erect lanceolate leaves, and narrow long-exserted panicle of relatively few spikelets. The plant is either entirely a light yellowish green in color, or the foliage may be deep purple in part.

It is characteristic of sandy or shallow soil on granite rock in thickets or grassy clearings. The species is well distributed across the southern Precambrian area as far north as Temagami, and reappears in western Ontario near the Manitoba boundary. Outlying localities are those in sandy woods at High Park, Toronto, at Galt (Cambridge), near Aylmer, Elgin County, and at Wasaga Beach, Simcoe County.

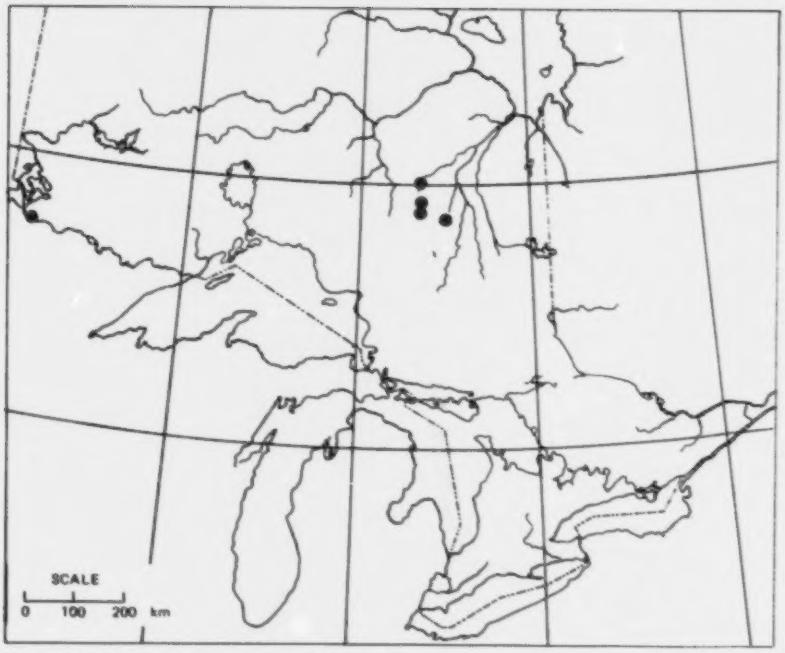
13. *Panicum latifolium* L.

Plate 63, Maps 231 and 232

broadleaf panic grass

Panicum latifolium with its large, almost heart-shaped leaves is not likely to be confused with any other species. The panicle is loose-flowered and pyramidal. Voss (1972*a*) demonstrates why the name *P. latifolium* should be retained for this species and not replaced by *P. macrocarpon* LeConte ex Eaton, as suggested by Baum (1967).

Leaf sheaths hairless, except for soft cilia on margin........................ a. var. ***latifolium***
Leaf sheaths almost prickly, with stiff spreading hairs................ b. var. ***clandestinum***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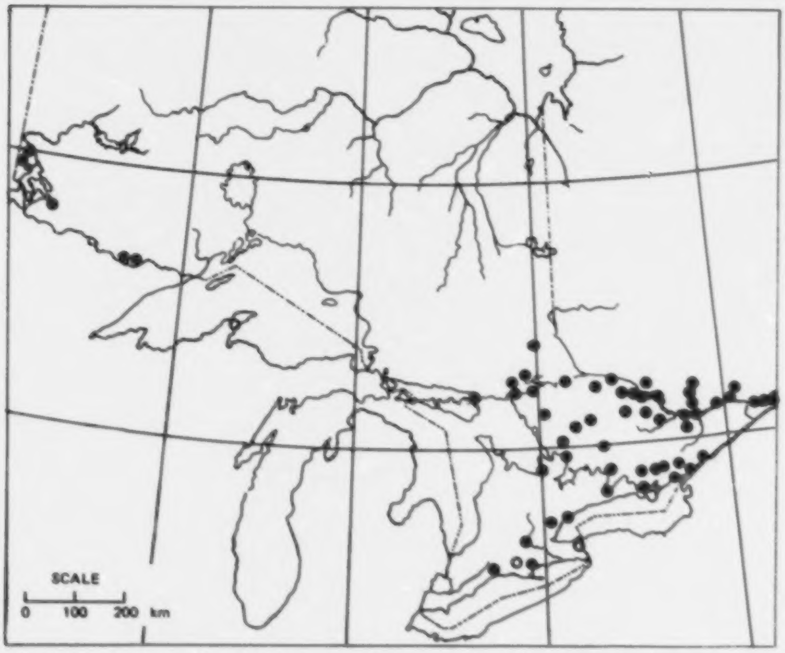
Map 229. *Panicum leibergii* var. *baldwinii*.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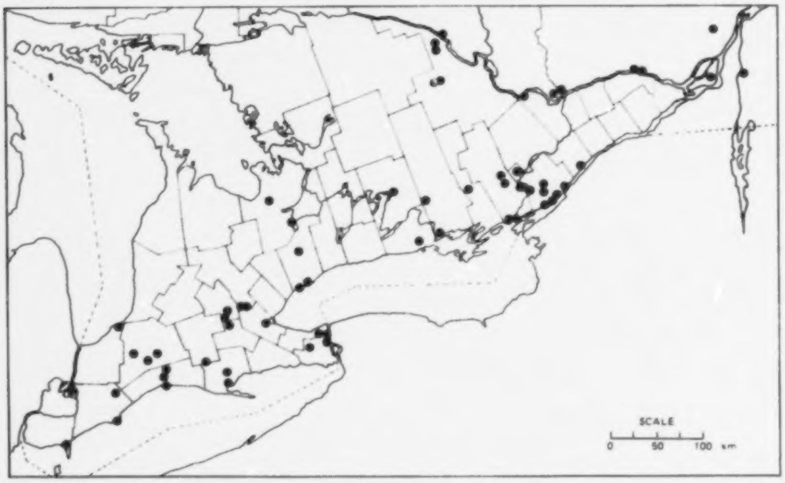
Map 230. *Panicum xanthophysum*. All known Canadian records from the area covered by the map are plotted.

13a. var. *latifolium*

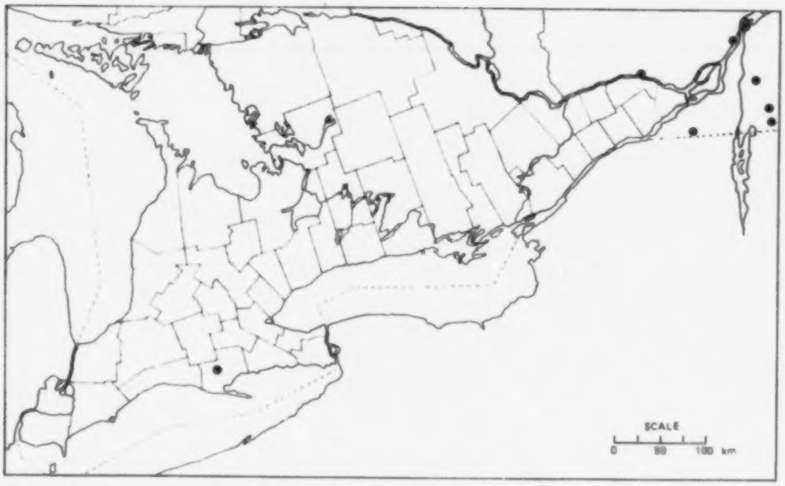
The typical var. *latifolium*, although with seemingly glabrous foliage, has a row of long cilia on the blade margins, finely appressed hairs on the upper surface, and soft cilia on the margins of the sheath. The variety is found in dry rich woodland, growing luxuriantly following clearing, and in roadside thickets, often on sandy soil. In eastern Ontario it grows in dry oak scrubland on granitic ridges, usually south-facing; at Rice Lake, Peterborough and Northumberland counties, and Crow Lake, Hastings County, it is found on crystalline limestone; the localities in southwestern Ontario are in mesic to dry woods on deep soil.



Map 231. *Panicum latifolium* var. *latifolium*. All known Canadian records from the area covered by the map are plotted.

13b. var. *clandestinum* (L.) Pursh (*P. clandestinum* L.)

Var. *clandestinum* has coarse-haired sheaths, the hairs being papillose-based and almost prickly. It is known at only one site in Ontario, along Big Creek about 8 km south of Delhi in the western part of the Regional Municipality of Haldimand-Norfolk. In Quebec, it extends up the Ottawa River to the rapids at Grenville and can be expected to occur in the easternmost counties of Ontario.



Map 232. ***Panicum latifolium*** var. *clandestinum*. All known Canadian records from the area covered by the map are plotted.

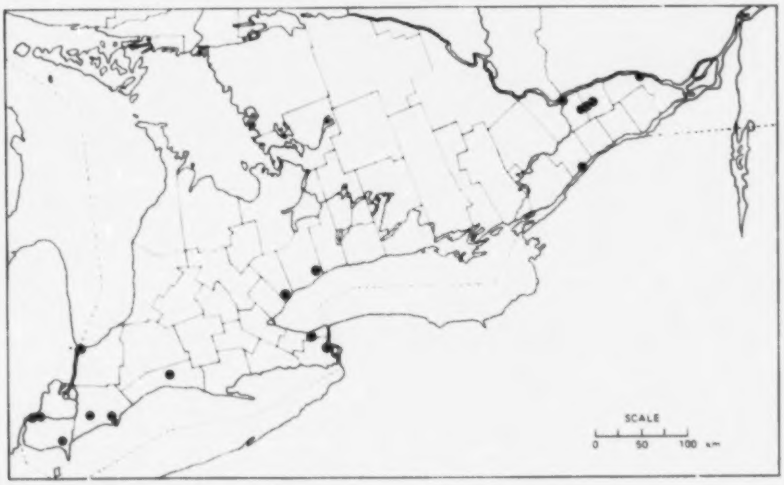
14. *Panicum dichotomiflorum* Michaux

Plate 63, Map 233

fall panic grass, fall panicum

A semisucculent annual with zigzag, smooth, and somewhat flattened stems, *Panicum dichotomiflorum* has an ample terminal panicle and lateral ones protruding from each leaf sheath in well-grown plants. The spikelets are 2.2–2.6 mm long, pointed, hairless, usually purplish, and arranged on appressed branchlets along the upper part of the main branches of the panicle. The ligule is 1.0–1.5 mm long and composed of stiff hairs fused together for half their length.

The increasing number of specimens indicate that this species, since entering Ontario more than four decades ago, is spreading sporadically along transportation routes and becoming an important weed in some areas as is the case in parts of the United States. It is not reported in the early lists from Ontario, although it has been known at Buffalo since 1882 (Zenkert 1934) and was found near Cleveland in 1894, at Port Huron, Michigan in 1916, and at Detroit in 1917. The earliest Ontario record is from Windsor in 1923, where it was collected in "low waste places" by M. L. Sheppard. In the last 25 years it has been found extensively in the southwesternmost counties. It is also known from the Niagara area, from Toronto, and from a few localities in eastern Ontario where it was first collected in 1949 near Carlsbad Springs, southeast of Ottawa (*see* Dore 1959). The species has been known at Chambly and Laprairie in Quebec for about 40 years (Cleonique-Joseph 1937) and seems to have been introduced at Halifax, Nova Scotia within the last 10 years. The species is native to the eastern United States.



Map 233. *Panicum dichotomiflorum.*

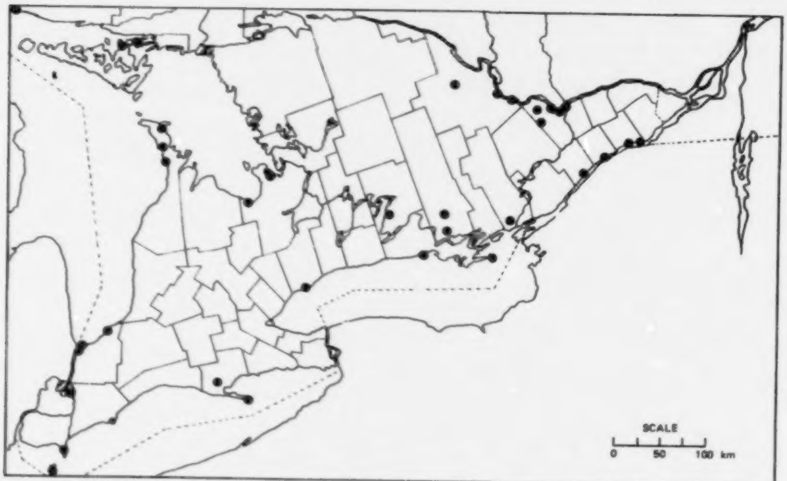
Several varieties have been recognized; of these var. *dichotomiflorum* and var. *geniculatum* (A. Wood) Fernald may occur in Ontario, but the distinctions between them are not altogether satisfactory and detailed study is required.

15. Panicum flexile (Gattinger) Scribner

Plate 63, Map 234

wiry witch grass

A scarce and inconspicuous species, *Panicum flexile* is distinguished from all the other annual species by the shape and sparsity of its panicle. It is usually found on limestone flood shores or on barren lime-charged flats, where it develops rapidly in midsummer and grows vigorously when the soil is disturbed; otherwise it seems to be depauperate.



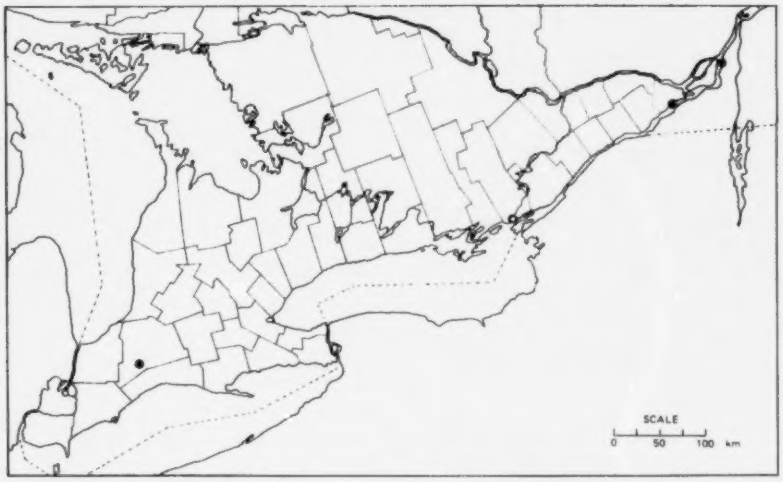
Map 234. *Panicum flexile.*

Although the species is scattered across southern Ontario, many of its known localities are along the shores of Lake Huron, as though it had spread from Lake Michigan. An inland station on a ditch bank near Simcoe, Regional Municipality of Haldimand-Norfolk, is unusual; most localities are along lakes or river systems. It is also found at several places in the Ottawa Valley and near the shores of Lake Ontario. Its appearance along the St. Lawrence River in the Prescott area since 1960 suggests a later migration for it was not recorded by Billings in 1860 (Billings 1862; Dore 1962). On the barren "Burnt Lands" near Kinburn, and near Almonte in the Ottawa-Carleton Regional Municipality, it flourishes on shallow soil temporarily flooded in wet weather.

16. *Panicum gattingeri* Nash

Map 235

Only two specimens of *Panicum gattingeri* are known from Ontario. The species most closely resembles *P. tuckermanii* and is probably related to it, but it is distinctive in its larger spikelets (2.0–2.2 mm long) and coarser growth. One of the collections comes from an unspecified site in Middlesex County, where it was found in moist sand near a river on September 8, 1951, by L. E. James. The other was collected in 1897 at Kingston by Fowler according to Hitchcock and Chase (1910).



Map 235. *Panicum gattingeri*. All known Canadian records from the area covered by the map are plotted.

The species has also been found at Boucherville Islands and Coteau-du-Lac on the flood shores of the St. Lawrence River in Quebec. The grass is reported to behave as a weed in some of the American states to the south, and presumably seed has been carried northward sporadically. The species has not, however, established itself in Ontario.

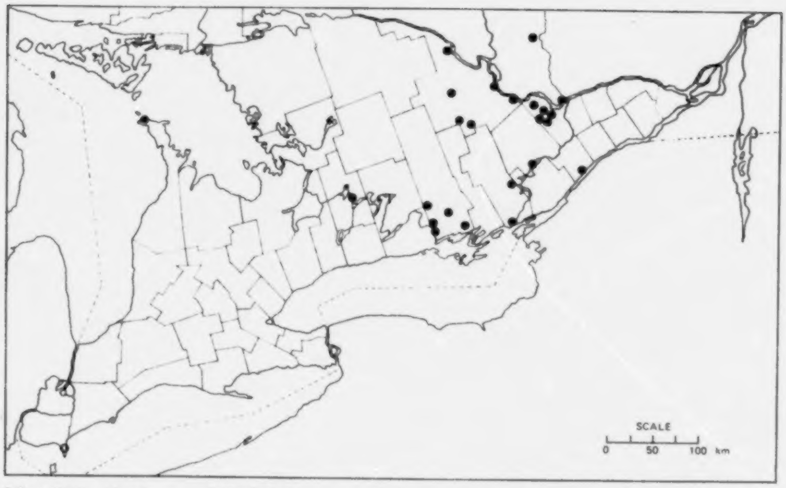
17. *Panicum philadelphicum* Bernh. ex Trin.

Plate 64, Map 236

Philadelphia witch grass

Distinctive in its overall yellow-green color and neat, ovate, long-exserted panicles, *Panicum philadelphicum* often becomes abundant on level limestone strata where only a slight accumulation of humus is formed by xerophytic mosses; it is sometimes also found on granitic rock or in adjacent poor sandy pastures.

The species is frequent in southern Hastings County and in part of the Ottawa-Carleton area. It is also found along rocky riverbanks in Renfrew County and in scattered localities elsewhere. The remote locality at Tobermory on the Bruce Peninsula is based on a depauperate specimen whose identity is not altogether certain. No specimen has been encountered to substantiate the report of Klugh (1906) from Point Pelee. Except for some Quebec locations across the river from Ottawa, this species does not occur in other parts of Canada, but is widely distributed in the eastern United States.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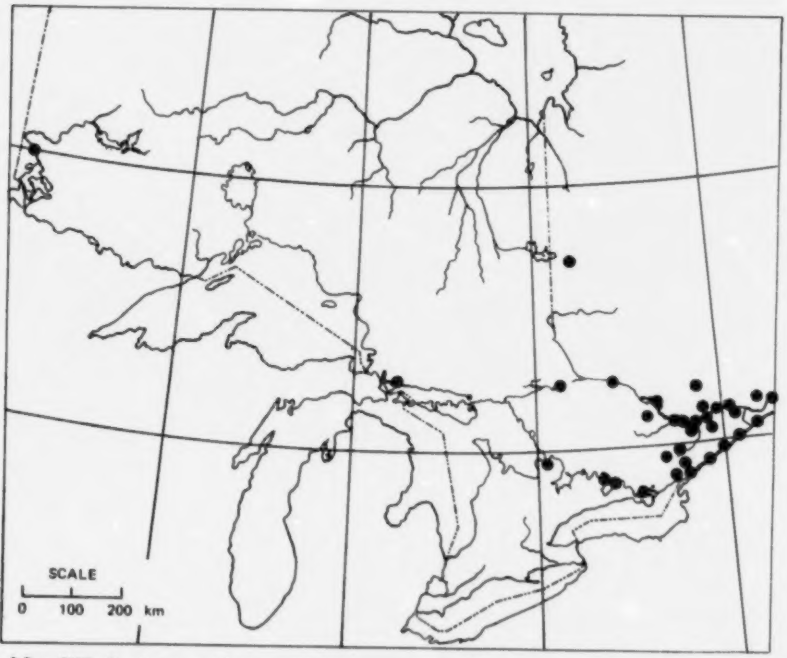
Map 236. *Panicum philadelphicum*. All known Canadian records from the area covered by the map are plotted.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Map 237. *Panicum tuckermanii*. All known Canadian records from the area covered by the map are plotted.

18. *Panicum tuckermanii* Fernald (*P. philadelphicum* Bernh. ex Trin., pro parte)

Plate 64, Map 237

Tuckerman witch grass

Panicum tuckermanii appears to inhabit only flood shores of streams and lakes, although it may be carried to nearby disturbed soil. It develops late in the season in open wet sands, or more often in the moss soil among shoreline herbs, where it is not so easily seen. The plants vary greatly in stature depending on the habitat. They appear on exposed sand as dwarf knotted clumps 1–2 cm across, or in moist shade with lank, reclining stems 30 cm long. Under garden cultivation, seeds from dwarf wild plants will grow into large, profusely branched, and abundantly seeded specimens; the spikelets, however, retain their characteristic size and shape.

The species is concentrated in eastern Ontario, an extension of its range along the St. Lawrence Valley and in the Maritime Provinces. A few outlying stations are known far to the west, such as those on the North Channel of Lake Huron at Bruce Mines, at Minaki, Kenora District, and in Manitoba on Hecla Island in Lake Winnipeg. These suggest that the seeds can be carried great distances, possibly in beach mud by sportsmen. There are large areas in Ontario with apparently suitable habitats where the grass is absent.

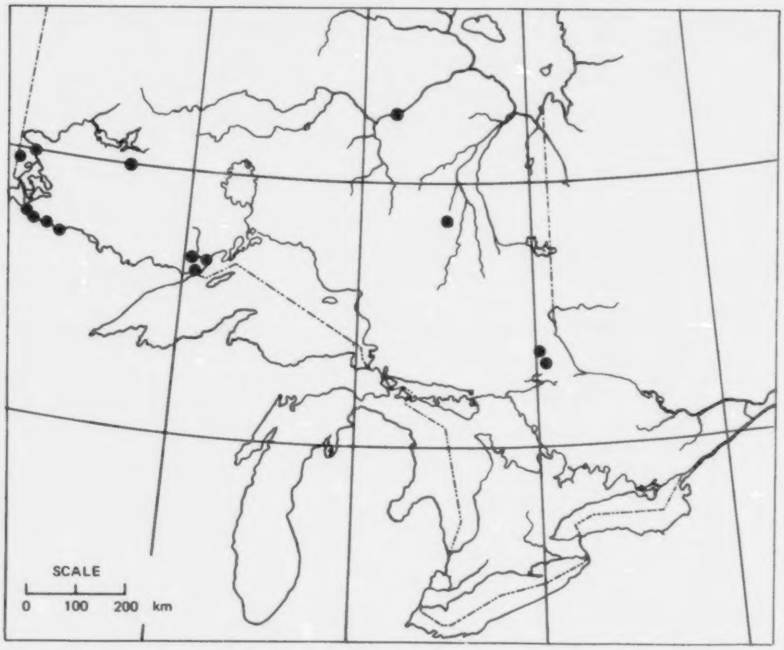
19. *Panicum capillare* L.

Plate 65, Maps 238 and 239

common witch grass

Originally native along beaches, flood-eroded banks, and other areas of natural open soil in the southern part of the province, *Panicum capillare* quickly spread to fields, roadsides, clearings, and gardens as European settlement progressed. It is now perhaps the species of greatest weed abundance among indigenous grasses. The earliest specimens, collected in the 1860s and 1870s, are often annotated "a common weed," or "a weed everywhere." Nevertheless, in northern Ontario it has not yet invaded all areas.

In its natural habitat, the plants are generally less then 30 cm in height, with panicles less than 15 cm across and are often quite inconspicuous. In fertile grainfields, in dumps, and under plot cultivation, plants from the same seed source grow to be 0.5–1 m high with panicles almost as wide. These plants are very prolific in tiller production. The characteristics of spikelet size, color, and hairiness do not, however, change under these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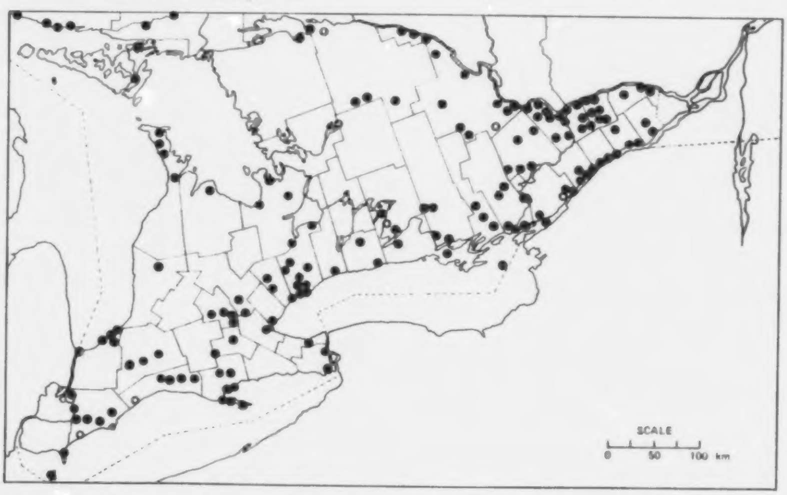
Map 238. ***Panicum capillare***. Distribution in northern Ontario; for distribution in southern Ontario, see Map 239.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Map 239. ***Panicum capillare***. Distribution in southern Ontario; for distribution in northern Ontario, see Map 238.

different growing conditions. Populations with smaller, longer-pediceled spikelets, with unusually large spikelets, or with a striking dark purple coloration are found locally, but indiscriminate dispersal has now confused any geographic pattern that may have existed.

The culm becomes brittle on ripening of the grains and fractures easily so that the whole panicle of springy fine branches drifts or bounces along in the wind as a tumbleweed, its smooth fruits freely shattering out. This feature may explain why *P. capillare* has become so widespread, while other species of the annual group of *Panicum* have remained scarce and confined to their original habitats.

Plants with spikelets 2.5–3.3 mm long (vs. 2–2.5 mm), with caryopses 1.7–1.8 mm long (vs. 1.5 mm), with shorter, less pubescent leaf blades, and with more exserted and divaricate panicles have been distinguished as *P. capillare* var. *occidentale* Rydb. Plants that may be referable to this variety occur in Ontario (e.g., in the Toronto area), but the characters do not seem to be consistently correlated in Ontario material and the taxon is not clearly separable.

20. *Panicum miliaceum* L.

Fig. 25, Plate 65, Map 240

broomcorn millet, common millet, hog millet, millet panic grass, panicum millet, proso

Panicum miliaceum is our only alien panic grass. It is native to the Old World where it has been cultivated as a staple cereal since early times and is still widely grown in the warm and arid countries of Asia, Africa, and Australia. Cultivars differ in their panicle type, whether open, nodding, or contracted, and in the color of the fruit, which may be white, cream, yellow, or orange. The sporadic plants that appear in Ontario are varied in these features.

The species was formerly cultivated to a limited extent in Ontario as a feed grain for poultry and hogs, and occasional plants would sometimes appear in the year following, but the species did not persist. The stray plants now encountered in waste places around dwellings, streets, and dumps result from discarded bird seed, of which *P. miliaceum* is a common component.

21. *Panicum virgatum* L.

Plate 65, Map 241

switch grass

A rather coarse perennial, essentially devoid of hairs, *Panicum virgatum* spreads in large clumps by short, hard, sharp-pointed rhizomes. It is the tallest of the Ontario panic grasses. Switch grass in its wide range over the eastern half of the United States shows much variation.

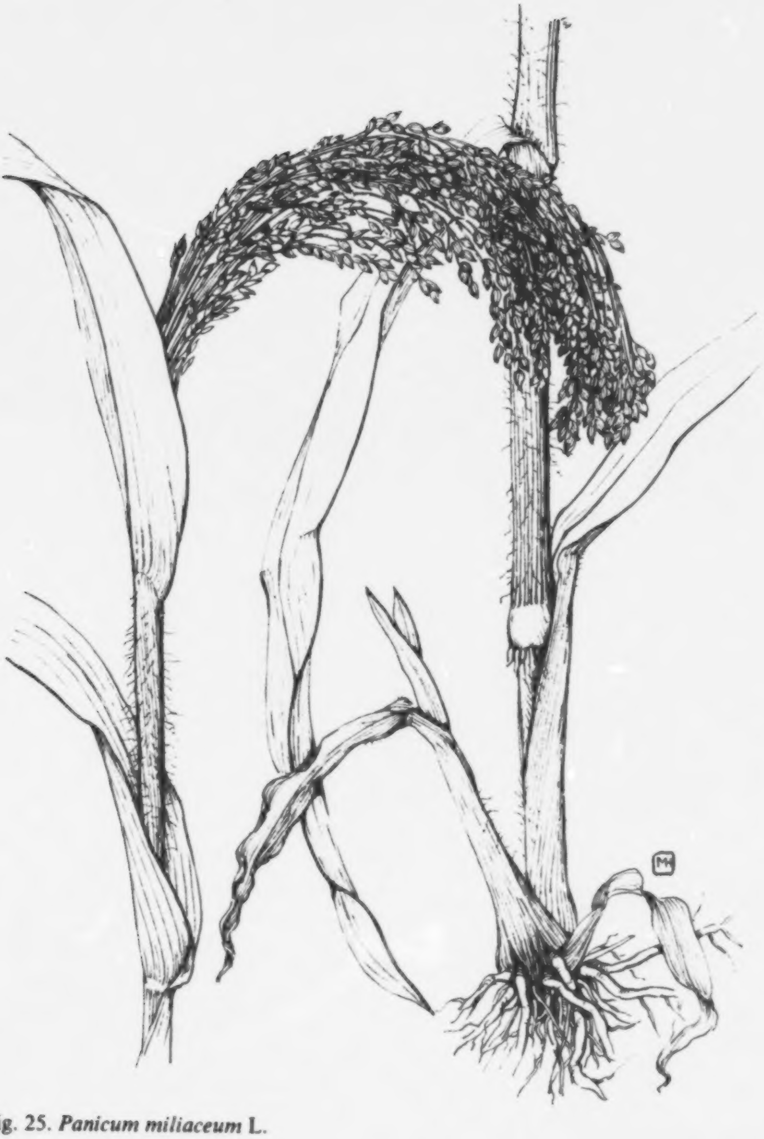
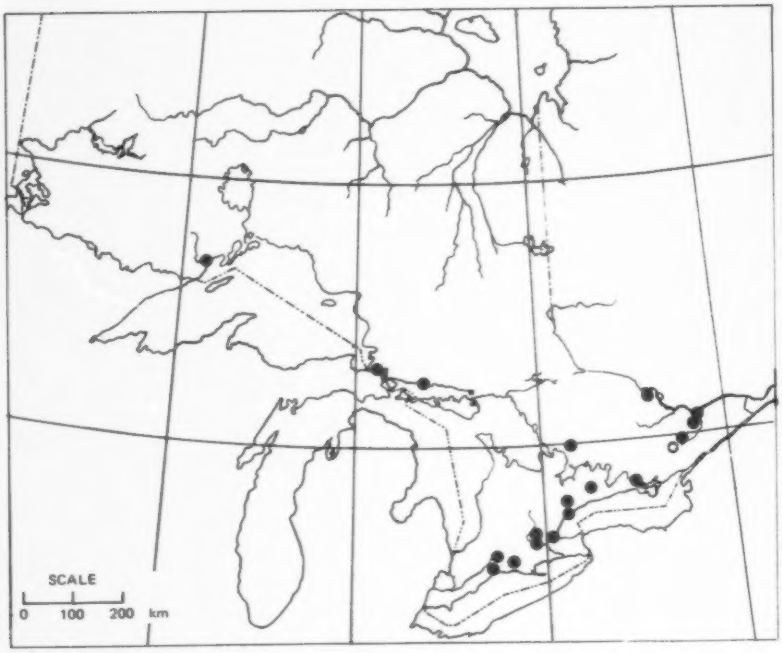


Fig. 25. *Panicum miliaceum* L.

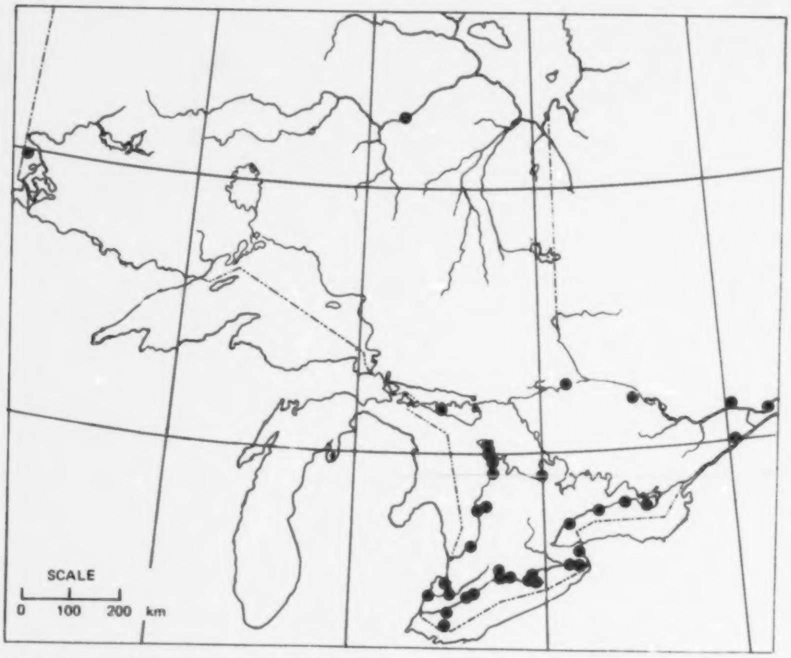


Map 240. *Panicum miliaceum*.

In Ontario two kinds of plants occur, one very large, 0.5–1 m high, with a wide panicle of spreading branches, and the other shorter, seldom as much as 60 cm high, with ascending panicle branches. These features are retained when clones are transplanted and cultivated in the same soil. The first type is characteristic of the sandy shores of the Lake St. Clair and Lake Erie areas, whereas the other grows generally in the province.

Specimens have often been collected from the beaches of Bruce County and around Grand Bend on Lake Huron, and at Point Pelee, Rondeau, and Lond Point on Lake Erie where the plant is conspicuous. Otherwise, the species is rare in Ontario. Two of the more remote localities are Ingolf on the Manitoba border, to which it has probably spread from the prairies, and on the Albany River, an unexpected station.

Other records clearly represent introductions, usually by railroads, for example Niagara Falls at the railway roundhouse in 1902, Port Hope on the railway in 1949, North Bay in a railway yard in 1954, and at Chalk River a single clump near the railway in 1961. The report for Wellington County (Stroud 1941) is probably based on plants cultivated at the Ontario Agricultural College, University of Guelph. All these plants, considered to be introduced, are similar to those in the midwestern United States, where the species is known to spread as a weed.



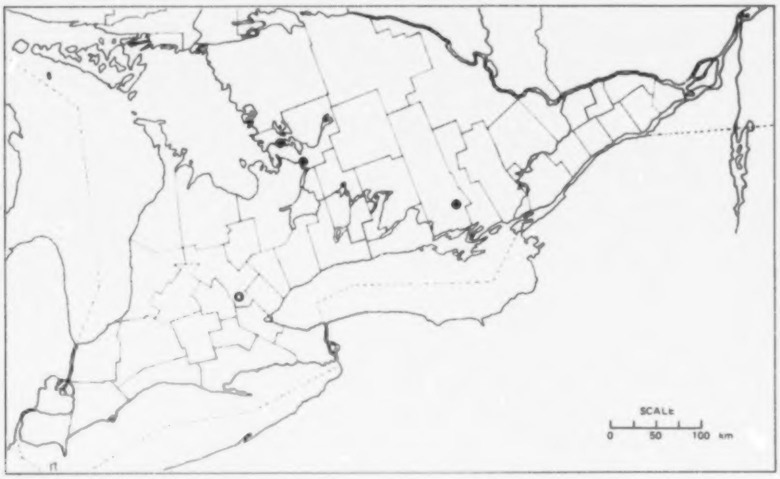
Map 241. *Panicum virgatum*. All known Canadian records from the area covered by the map are plotted.

22. *Panicum rigidulum* Bosc ex Nees (*P. agrostoides* Sprengel)

Map 242

Until recently *Panicum rigidulum* was known in Canada only from the shores of the Moira River and adjoining wet pastureland below Stoco Lake, Hastings County, where well-naturalized occurrences were detected in 1951. These plants cover "a stretch of at least five miles" and may represent an early introduction. In 1975 the species was found growing in rock fissures near the shore of Sparrow Lake south of Gravenhurst in the Muskoka municipality where it may be a native occurrence.

The record for Wellington County (Stroud 1941) is based on a correctly identified but fragmentary specimen growing on "wet meadows and shores, Guelph, July 17, 1937, Leona MacDougall." This specimen is presumed, from enquiry, to be labeled fictitiously. South of Ontario the species is reported from North Bass Island in Lake Erie (Core 1948) and as a casual at East Buffalo (Zenkert 1934). The reasons for rejecting the usual name, *P. agrostoides* Sprengel, are given by Voss (1966).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Map 242. *Panicum rigidulum*.

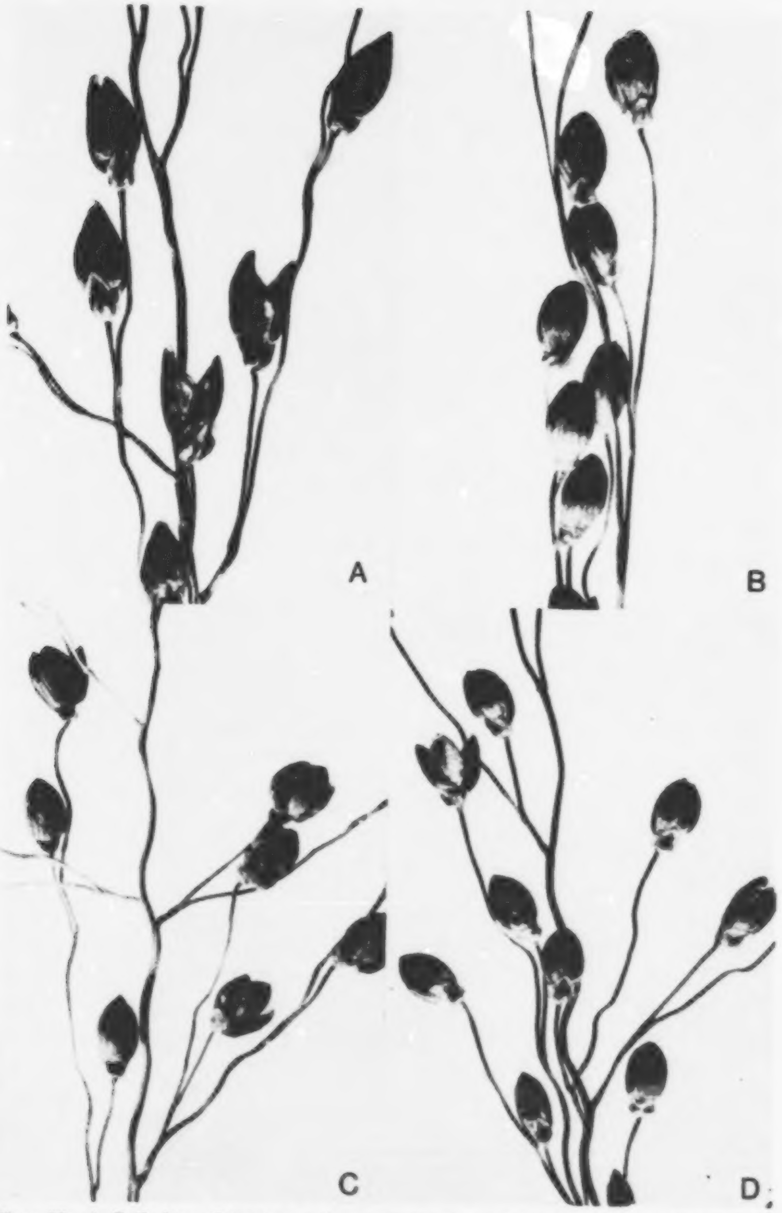


Plate 60. *A*, Spikelets of *Panicum depauperatum* var. *involutum* (Dore 20259); *B*, Spikelets of *P. perlongum* (Dore 8696B); *C*, Spikelets of *P. linearifolium* var. *linearifolium* (Dore 21525); *D*, Spikelets of *P. linearifolium* var. *werneri* (Cody and Dore 11122).

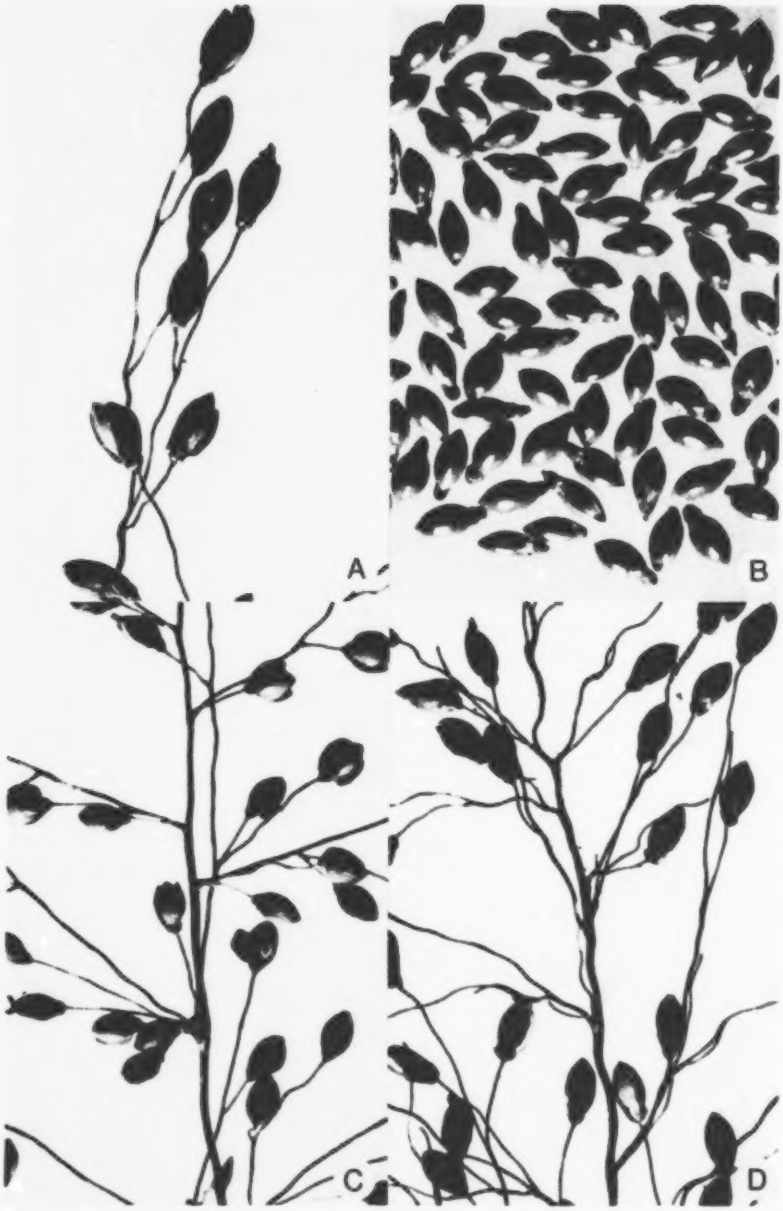


Plate 61. *A*, Spikelets of *Panicum boreale* var. *boreale* (Dore and Brayshaw 21649); *B*, Florets of *P. boreale* var. *boreale* (Dore and Brayshaw 21649); *C*, Spikelets of *P. lanuginosum* var. *fasciculatum* (Dore 21520); *D*, Spikelets of *P. columbianum* var. *siccanum* (Dore 20900).

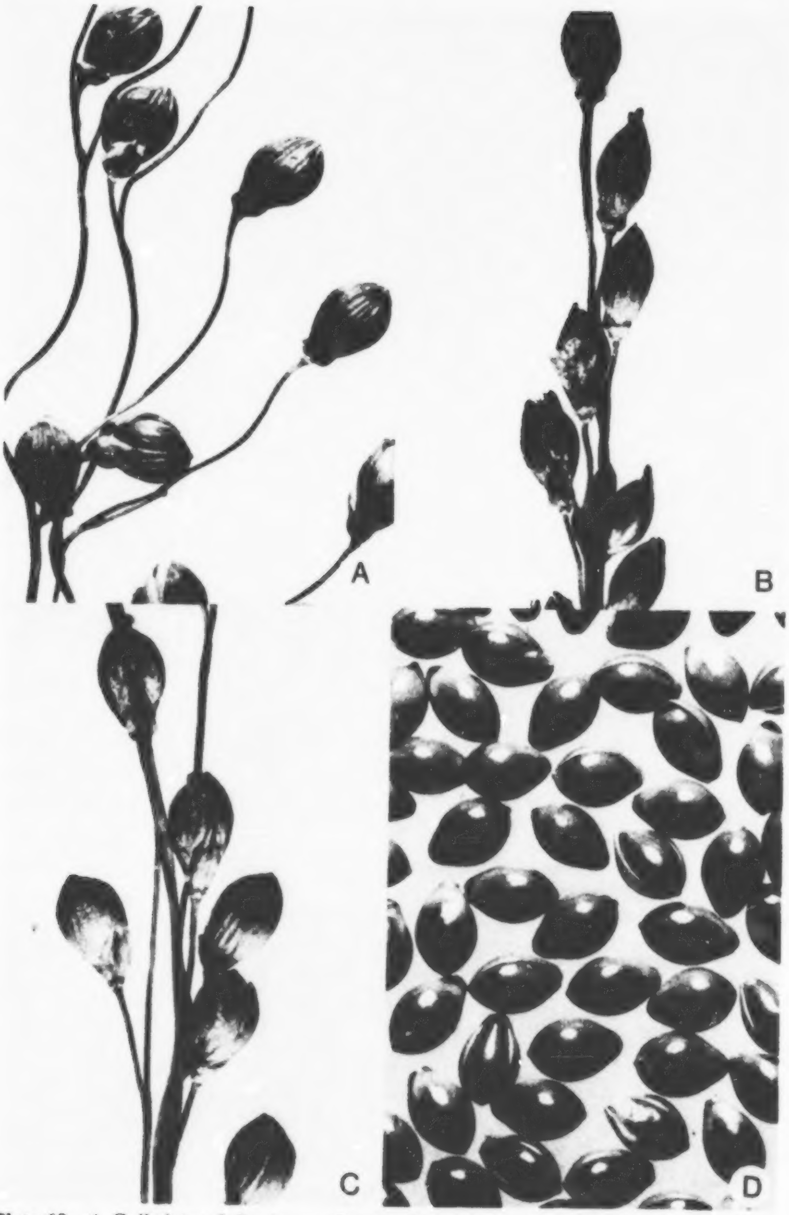


Plate 62. *A*, Spikelets of *Panicum oligosanthes* var. *scribneriana* (Dore and Marchant 24069); *B*, Spikelets of *P. leibergii* var. *baldwinii* (Dore 19413); *C*, Spikelets of *P. xanthophysum* (Dore 16696); *D*, Florets of *P. xanthophysum* (Dore 10609).

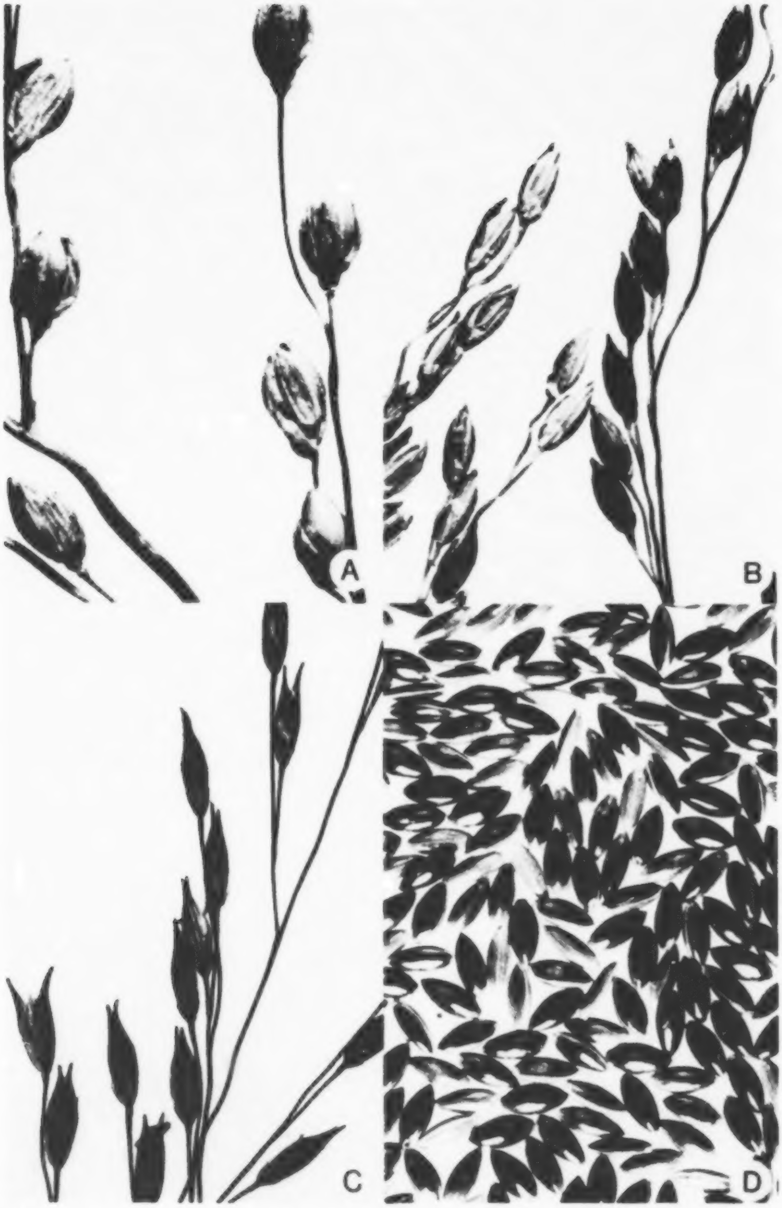


Plate 63. *A*, Spikelets of *Panicum latifolium* var. *latifolium* (Dore 16702); *B*, Spikelets of *P. dichotomiflorum* (Montgomery 916); *C*, Spikelets of *P. flexile* (Dore 18352); *D*, Florets of *P. flexile* (Dore 18352).

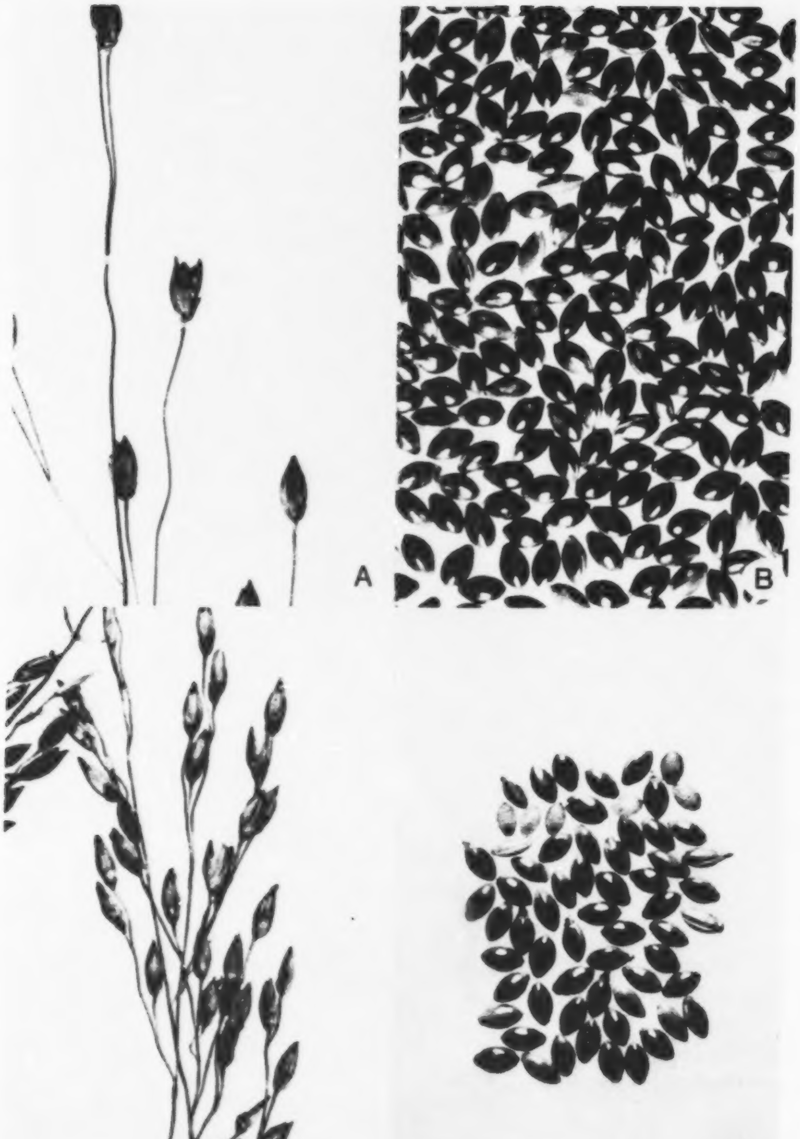


Plate 64. *A*, Spikelets of ***Panicum philadelphicum*** (Dore 18345); *B*, Florets of *P. philadelphicum* (Dore 18345); *C*, Spikelets of *P. tuckermanii* (Dore 18425); *D*, Florets of *P. tuckermanii* (Dore 17045).

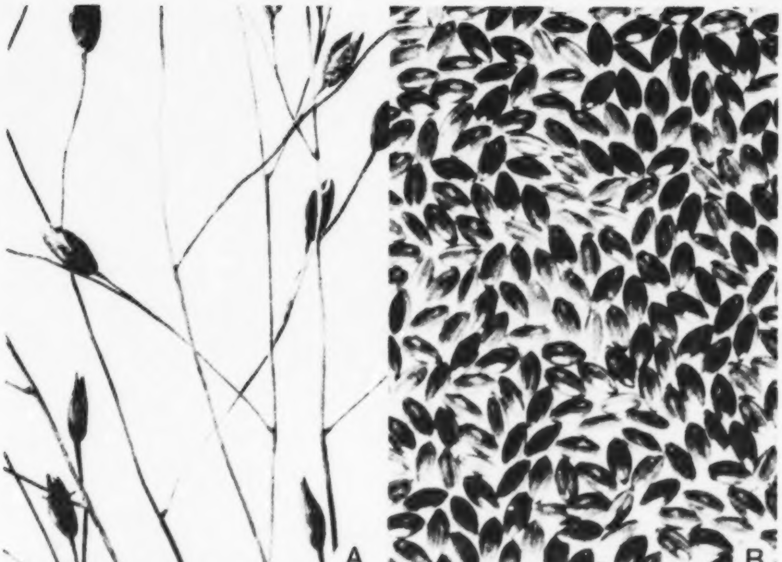


Plate 65. *A*, Spikelets of ***Panicum capillare*** (Dore 21106); *B*, Florets of ***P. capillare*** (Dore 17450); *C*, Florets of ***P. miliaceum*** (Frankton 1644); *D*, Spikelets of ***P. virgatum*** (Dore 16832).

70. Echinochloa Beauv.

Annual grasses with stout, somewhat succulent stems. Leaf blades wide, hairless, with a prominent and sharp midrib; ligule absent; collar distinct. Inflorescence a panicle of dense, more or less one-sided spike-like clusters, arranged racemosely on the main axis; spikelets falling away entire at maturity. Lower glume about half the length of spikelet body; upper glume and sterile lemma equal in length, bearing long one-celled trichomes with bullate base. Sterile lemma often drawn out into a long coarse awn. Fertile floret plano-convex; lemma smooth, hard and shiny, involute, enclosing the similar-textured palea except for the slightly protruding tip.

A. Leaf sheaths papillose-hispid or papillose-scabrous; panicle usually 20–30 cm long, densely crowded, with conspicuously long-awned spikelets; native; wet soil along Lake Erie and Lake St. Clair and along shores in eastern Ontario .... 5. ***E. wateri***

A. Leaf sheaths smooth and hairless; spikelets short- or long-awned; panicle usually 10–20 cm long, not forming a densely crowded mass of long-awned spikelets

  B. Fertile lemma with a dull-colored and wrinkled tip marked off rather abruptly from the shiny smooth body, the lemma body thus appearing obtuse; minute setae present on the shiny portion of the fertile lemma just below the wrinkled tip; trichomes of spikelet rather straight, appressed-ascending, slender; weed in open habitats; an Old World species exhibiting much variation in panicle form and habit .... 1. ***E. crusgalli***

  B. Fertile lemma continued into a firm beak-like tip, lemma body thus appearing acuminate; transverse row of setae absent from base of beak of fertile lemma; trichomes of spikelet somewhat curved, spreading, coarse; native species

    C. Spikelets 3.3–4.5 mm long, 1.8–2.2 mm wide; anthers 0.7–0.8 mm long; trichomes numerous, coarse; panicle with wide-spreading branches; confined to shorelines .... 2. ***E. muricata***

    C. Spikelets 2.8–3.4 mm long, 0.4–1.8 mm wide; anthers 0.4–0.7 mm long; panicle contracted

      D. Trichomes numerous, coarse, covering the spikelets, their strongly bullate and yellowish bases contrasting with the dark purple-brown lemma and palea; shores and wetlands .. 3. ***E. microstachya***

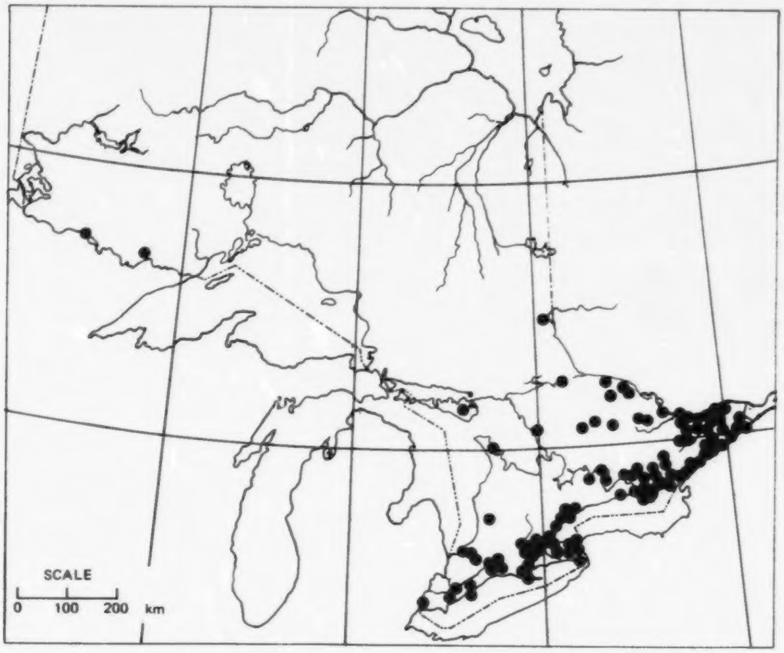
      D. Trichomes relatively few, rather slender, marginal on the sterile lemma and absent on its midrib, the papillose bases merging with the greenish, greenish-purple, or bronze spikelets; shores and weed of roadsides and open habitats .... 4. ***E. wiegandii***

1. *Echinochloa crusgalli* (L.) Beauv.

Figs. 26 and 27, Plate 66, Map 243

barnyard grass, cockspur grass

A weed in the moist rich soils of barnyards, gardens, grain fields, dumps, and roadsides, *Echinochloa crusgalli* was introduced at an early date from Europe. It is mentioned in accounts of 100 years ago as common around all settlements and is still a serious weed in the croplands of southern Ontario. Plants of the species do not survive long in the northern parts of the province and have not invaded the Prairie Provinces. Many reports of its abundance are misleading because of the confusion with native species, especially *E. wiegandii*, which has spread rapidly in recent decades.



Map 243. *Echinochloa crusgalli.*

Great variation is shown in the fullness of the panicle, the degree of red coloration, and the length of spikelet awns. The vigor of growth also varies because it is strikingly affected by field conditions. Three variations in awn length seem to occur: spikelets awnless or with a few awns up to 5 mm long (this type of plant is common); some spikelets shortly awn-pointed but

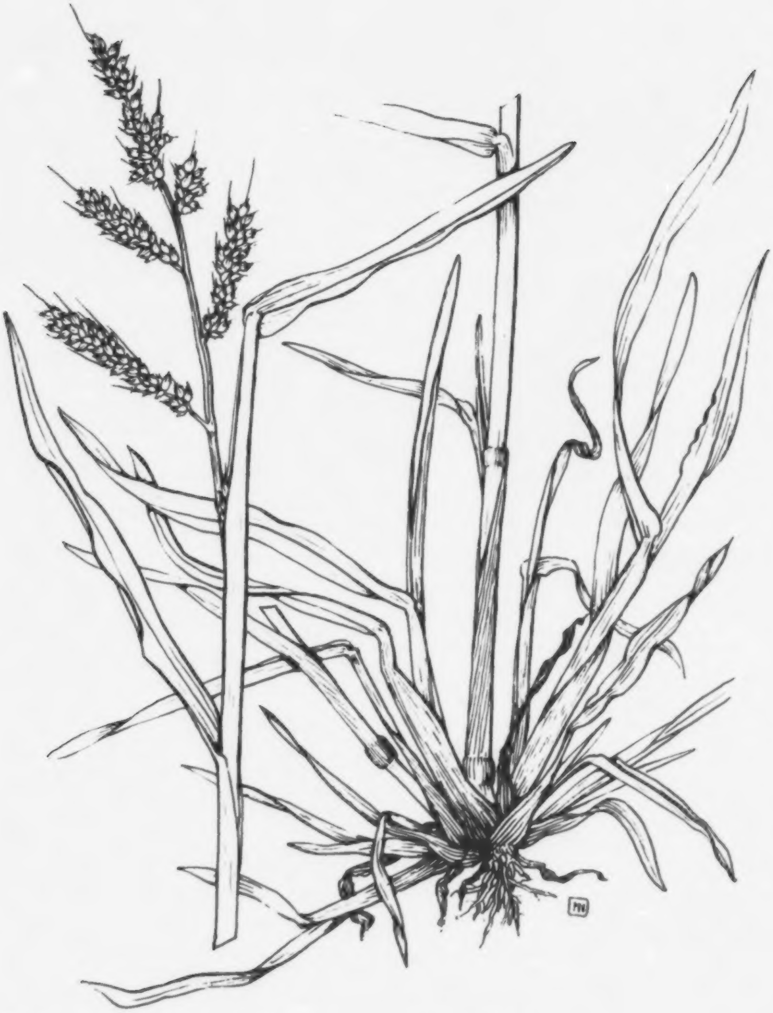


Fig. 26. *Echinochloa crusgalli* (L.) Beauv. var. *crusgalli*.

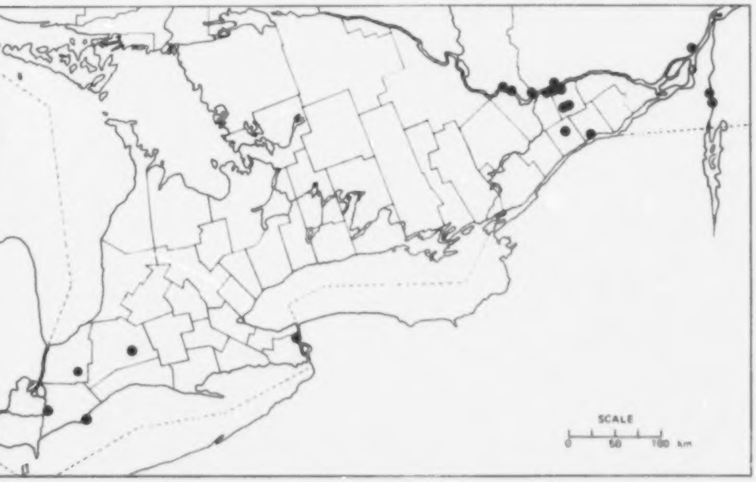
mixed with others with awns about 15 mm long (also common); and most spikelets with awns 20–40 mm long (resembling *E. walteri* in this feature). This last type of plant has been called f. *longiseta* (Trin.) Farwell and is scarce in Ontario.

In the past, strains of *E. crusgalli* were promoted as "billion-dollar grass" for fodder and grain because of the vigorous growth of its succulent stems. A distinctive selection (Japanese millet) with congested panicles of pink or purple awnless spikelets is known as var. *frumentacea* (Link) W. F. Wight, or is treated as a distinct species (*E. frumentacea* Link). It is grown as a green hay crop or for poultry fee. More recently it has been used as an ingredient of bird seed and is recommended for planting in wetlands for wildfowl. Stray plants of this variant may be seen in dumps or along field margins but do not perpetuate themselves from year to year.

2. *Echinochloa muricata* (Beauv.) Fernald (*E. pungens* (Poiret) Rydb. var. *pungens*)

Plate 66, Map 244

Distinct in its larger spikelets and few, wide-spreading or reflexed panicle segments, *Echinochloa muricata* is very rare in Ontario. In the southwestern peninsula it is known from Bradley's Marsh at Lake St. Clair, near Cairo, Lambton County, from Rondeau on Lake Erie, from London, and from Niagara. These stations represent the northward fringe of its



Map 244. *Echinochloa muricata*. All known Canadian records from the area covered by the map are plotted.

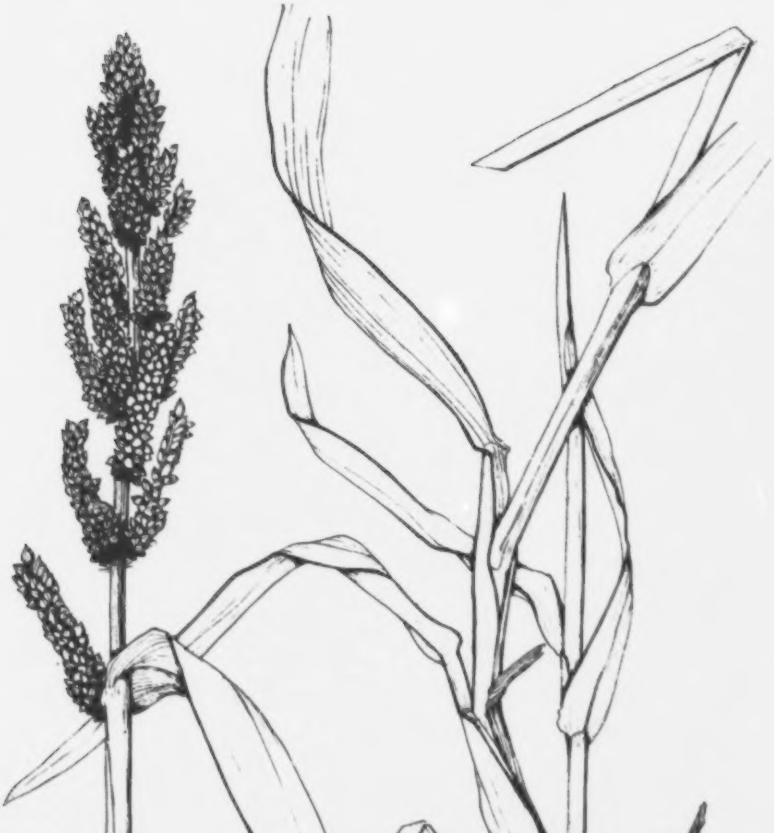


Fig. 27. *Echinochloa crusgalli* (L.) Beauv. var. *frumentacea* (Link) W. F. Wight.

continuous range. In the eastern counties the species has been looked for more carefully, and is known from Hoople Creek (now flooded by the St. Lawrence Seaway), from the middrainage of the South Nation River system in Dundas and Russell counties, and from the shores of the Ottawa River for about 30 km above and below the city of Ottawa. This pattern of distribution suggests migration along the estuarine shores of a late stage in the Champlain Sea withdrawal; localities around Montreal and along the Richelieu River in Quebec fit in with such a pattern. The next localities eastward in Canada are in the estuary of the Saint John River in New Brunswick.

It was pointed out by Fairbrothers (1956) and Reeder (1956) that the specific epithet *muricata,* although originally published illegitimately by Michaux in 1803, can legitimately date from Palisot de Beauvois' use of it (in *Setaria*) in 1812, and so predates the widely used epithet *pungens,* which was first published by Poiret only in 1816.

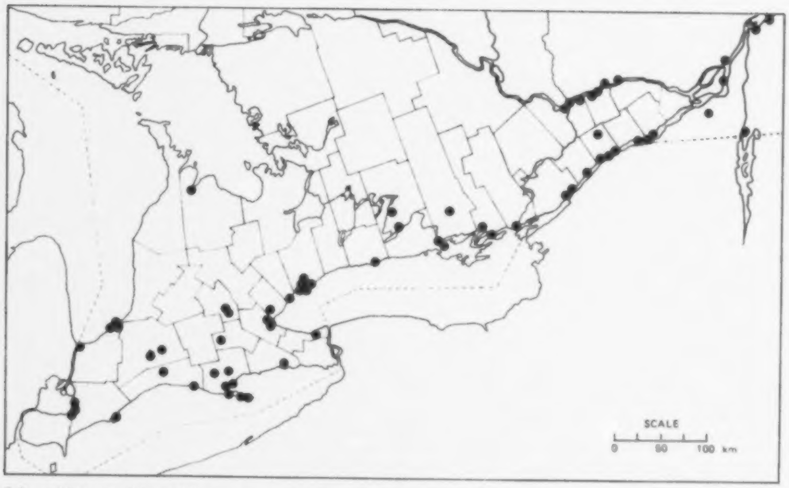
Much of the confusion in separating this and the two following species of native *Echinochloa* from the introduced members of the *E. crusgalli* complex results from failure to recognize the minute setae in their particular position on the fertile lemma, as clearly demonstrated by Fassett (1949). Quite apart from this, the taxa occurring in Ontario can readily be discerned in the field by their habit of growth, panicle color, and other features, and specific rank rather than varietal seems justified. *E. muricata* appears to be consistently tetraploid, $2n = 36$, whereas *E. crusgalli* seems always to be hexaploid, $2n = 54$ (Gould et al. 1972).

3. *Echinochloa microstachya* (Wieg.) Rydb. (*E. crusgalli* var. *mitis* (Pursh) Peterm., pro parte; *E. pungens* var. *microstachya* (Wieg.) Fernald & Griscom)

Plates 66 and 67, Map 245

Distinctive in its densely spikeleted, dark purple (greenish in the shade) panicles that appear bristly, *Echinochloa microstachya* is rather abundant on the shores of the lower Great Lakes from the vicinity of Ipperwash on Lake Huron down to the St. Lawrence River, and into Quebec as far as Lake St. Peter and Quebec City. It also occurs along some rivers and streams inland from the Great Lakes, such as the Ottawa, Moira, Trent, Grand, and Thames rivers.

Plants are also found along moist graded roadsides and excavations at short distances from natural shorelines. On the Ottawa River, *E. microstachya* does not extend more than a few kilometres above the city of Ottawa and is not known from any of the tributaries, suggesting that the grass may have invaded the system since settlement. An Owen Sound collection made in 1901 by Macoun has not been repeated, and another far-removed station (beyond map border), on a roadside at Pigeon River Bridge, Thunder Bay



Map 245. *Echinochloa microstachya.* All known Canadian records from the area covered by the map are plotted.

District on the Minnesota border, seems to represent a recent introduction from the western portion of the range in the United States.

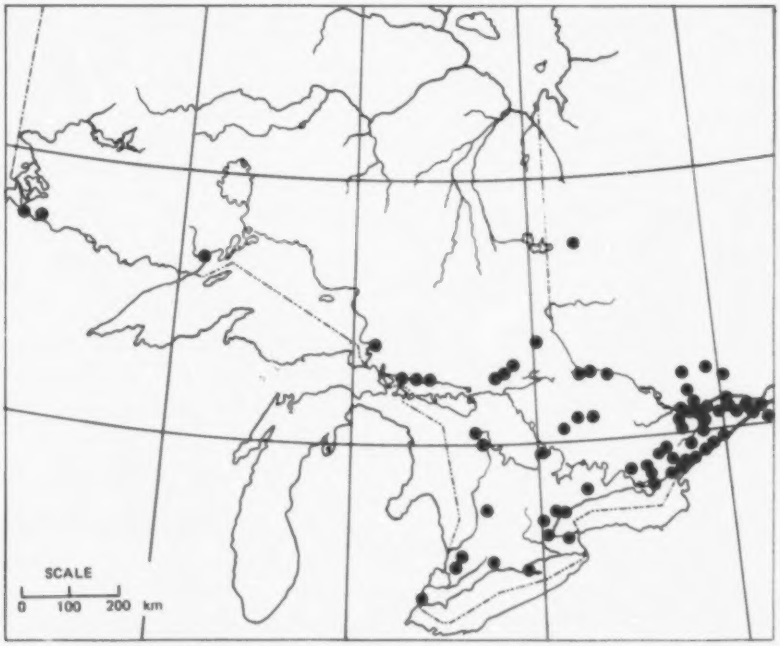
4. *Echinochloa wiegandii* (Fassett) McNeill & Dore (*E. crusgalli* var. *mitis* (Pursh) Peterm., pro parte; *E. occidentalis* auct.; *E. pungens* var. *wiegandii* Fassett)

Plate 67, Maps 246 and 247

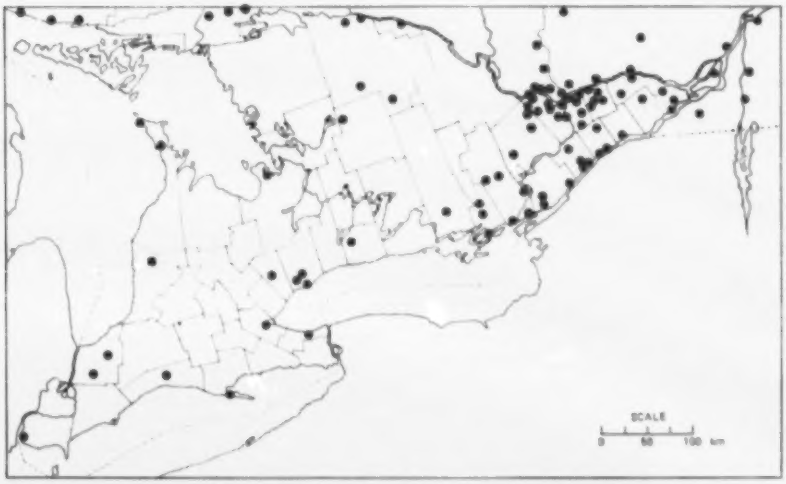
western barnyard grass

More widespread in Ontario than the other native species, *Echinochloa wiegandii* appears to have been confined originally to riverbanks and shores from the Ottawa Valley to Lake Huron and southward. With the advance of settlement, it spread rapidly as a weed to roadsides and disturbed habitats. The occurrences in the western and northern parts of the province have likely arisen from seeds in feed grain from the Prairie Provinces, where the species is now abundant.

This predominantly western taxon was first distinguished by Wiegand (1921), as *E. muricata* var. *occidentalis*, and later accepted at specific rank with the same epithet by Rydberg (1931), Gleason (1952), and Gleason and Cronquist (1963). The reasons for the change of epithet are discussed by



Map 246. *Echinochloa wiegandii*. All known Canadian records from the area covered by the map are plotted. For detail of distribution in southern Ontario and adjacent Quebec, see Map 247.



Map 247. *Echinochloa wiegandii*. Detail of distribution in southern Ontario; for general distribution in Ontario and western Quebec, see Map 246. All known Canadian records from the area covered by the map are plotted.

Fassett (1949) and McNeill and Dore (1977). As noted under *E. muricata,* the field differences in habit and habitat preference suggest recognition at specific rather than varietal rank.

5. *Echinochloa walteri* (Pursh) Heller

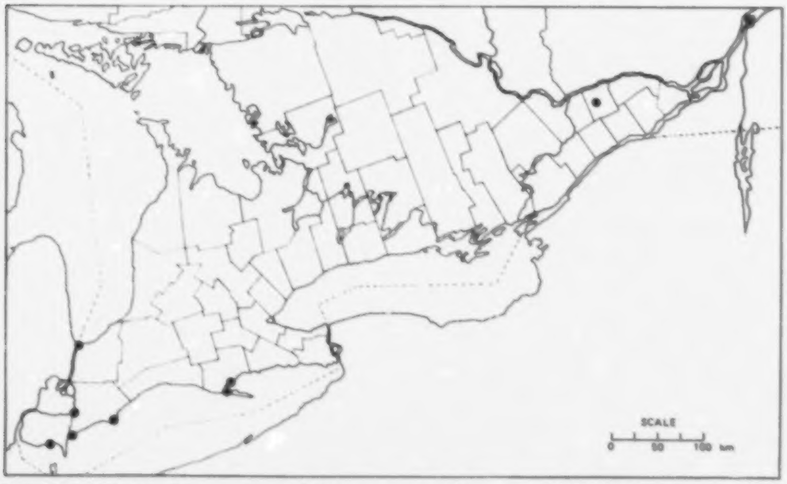
Plate 67, Map 248

Walter's barnyard grass

A tall rank grass with long-bearded panicles, *Echinochloa walteri* is common in marshes and ditches in the eastern half of the United States. It finds its northern limit as a rare species at a few places in southwestern Ontario, such as at Bradley's Marsh on Lake St. Clair, and at Kingsville, Wheatley, Long Point, and Turkey Point on Lake Erie.

The broad statement for Lambton County (Dodge 1915), "occasional in ditches and damp places," can be substantiated only by an early specimen collected by Macoun in 1884 at Point Edward. No more recent specimens have been detected (Gaiser and Moore 1966). The Point Pelee report (Dodge 1914), "common in damp places near creeks flowing into Lake Erie along north shore," refers to sites outside Point Pelee proper.

Localized occurrences at Cobb Lake in Russell County (Dore 1953) and at LaValliere Bay, Lac St. Pierre, Quebec (Raymond 1950, pp. 87–88), are isolated from those southward in the United States.



Map 248. *Echinochloa walteri*. All known Canadian records from the area covered by the map are plotted.

Rhynchelytrum repens (Willd.) C. E. Hubbard (R. roseum (Nees) Stapf & C. E. Hubbard)—This grass, known as natal grass, is an annual grown for its somewhat ornamental panicles of silky, silvery, or pink spikelets. It is abundant as a weed in the southern United States and Mexico, where it was originally cultivated as a forage grass introduced from South Africa. In Ontario it can be grown to the flowering stage, but it does not escape or persist from year to year. Specimens are only known from gardens.

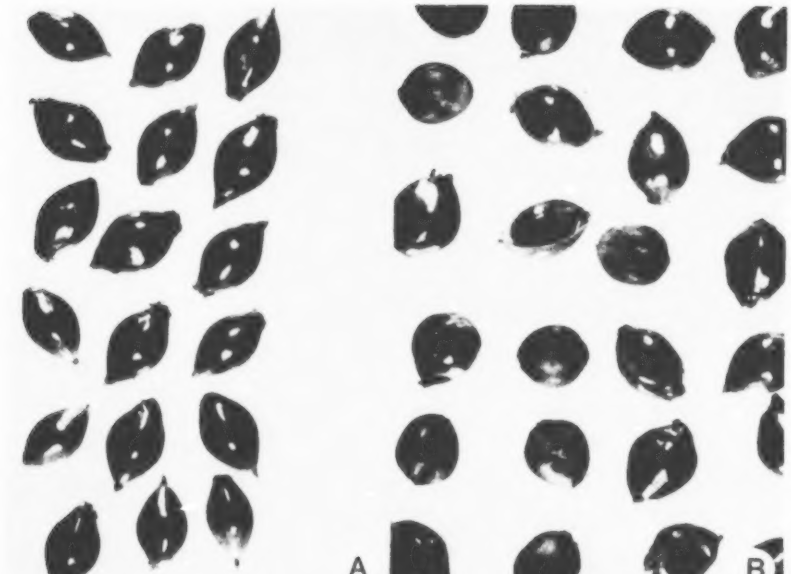


Plate 66. *A*, Florets of *Echinochloa crusgalli* var. *crusgalli* (James 2667); *B*, Florets and caryopses of *E. crusgalli* var. *frumentacea* (Dore 17116); *C*, Spikelets and florets of *E. muricata* (Dore 14785); *D*, Spikelets of *E. microstachya* (Dore 21873A).

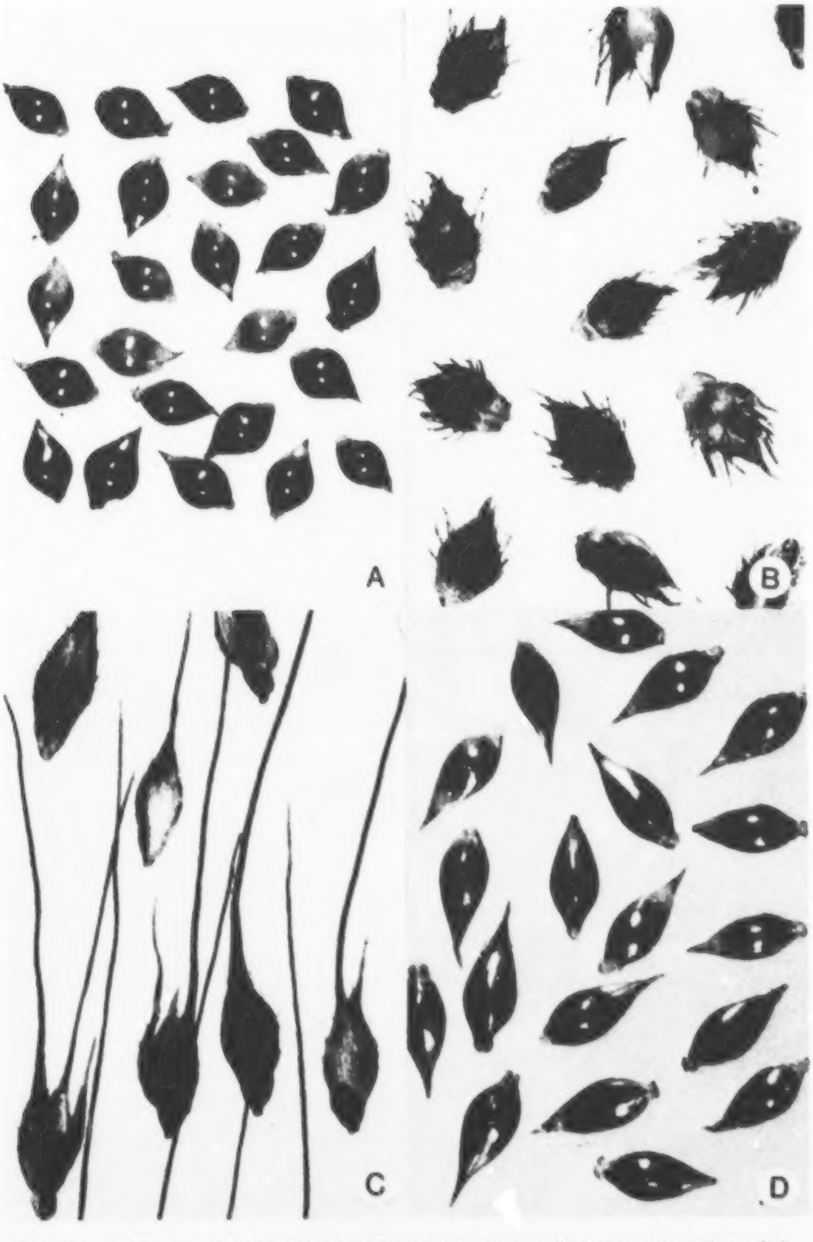


Plate 67. *A*, Florets of *Echinochloa microstachya* (Dore 12873A); *B*, Spikelets of *E. wiegandii* (Dore 12756); *C*, Spikelets of *E. walteri* (Dore and Cody 14048); *D*, Florets of *E. walteri* (Dore and Cody 14048).

71. Setaria Beauv.

Annual introduced weeds and cultivated grasses. Ligule a row of short hairs fused together at their base. Panicles spike-like, terminating the stems; upper portion of culm, rachis, and pedicels scabrous or hairy. Spikelets awnless, but each subtended by one to several scabrous awn-like bristles that exceed the spikelet in length. Lower glume one-quarter to one-half length of spikelet; upper glume one-half to full length of spikelet. Sterile lemma similar to the upper glume; fertile lemma hard and brittle, sometimes cross-wrinkled, involute-margined, and enfolding the similarly hard, brittle palea.

A. Bristles below each spikelet more than 5, orange or tawny; upper glume covering about half the coarsely transverse-rugose fertile lemma; upper surface of leaf blade with a few long (greater than 4 mm) hygroscopic hairs just above the ligule; leaf sheaths glabrous on margins, keeled; spikelets about 3 mm long .... 1. ***S. glauca***

A. Bristles below each spikelet 1–3, green or purplish; upper glume covering all the minutely transverse-rugose or essentially smooth fertile lemma; upper surface of leaf blade without hairs, or with shorter hairs (0.5–3.5 mm) ± throughout; leaf sheath fringed on margins with ascending hairs, not keeled; spikelets 1.9–2.9 mm long

- B. Spikelets in spaced clusters or verticils especially toward the base of panicle, with portions of the rachis visible between them; fertile lemma minutely transverse-rugose; leaf blades with a few hairs on upper surface; scabrous bristles, rachis and upper culm with upwardly or downwardly directed barbs .... 5. ***S. verticillata***
- B. Spikelets not in spaced clusters on rachis; fertile lemma essentially smooth; leaf blades hairy or hairless on upper surface; scabrous bristles, rachis and upper culm with upwardly pointed barbs
  - C. Fertile floret separating from glumes and sterile lemma at maturity; panicle (excluding bristles) 7–15 mm diam, cylindrical but often lobed or interrupted .... 3. ***S. italica***
  - C. Entire spikelet falling away completely at maturity leaving a cup-like scar on the pedicel; panicle (excluding bristles) 4–8(–10) mm diam, narrowly cylindrical
    - D. Spikelets 1.9–2.3(–2.4 mm) long; upper glume covering at least nine-tenths of the fertile lemma; leaf blades glabrous .... 2. ***S. viridis***
    - D. Spikelets 2.4–2.8 mm long; upper glume covering three-quarters to five-sixths of the fertile lemma; leaf blades usually with hairs on the upper surface .... 4. ***S. faberi***

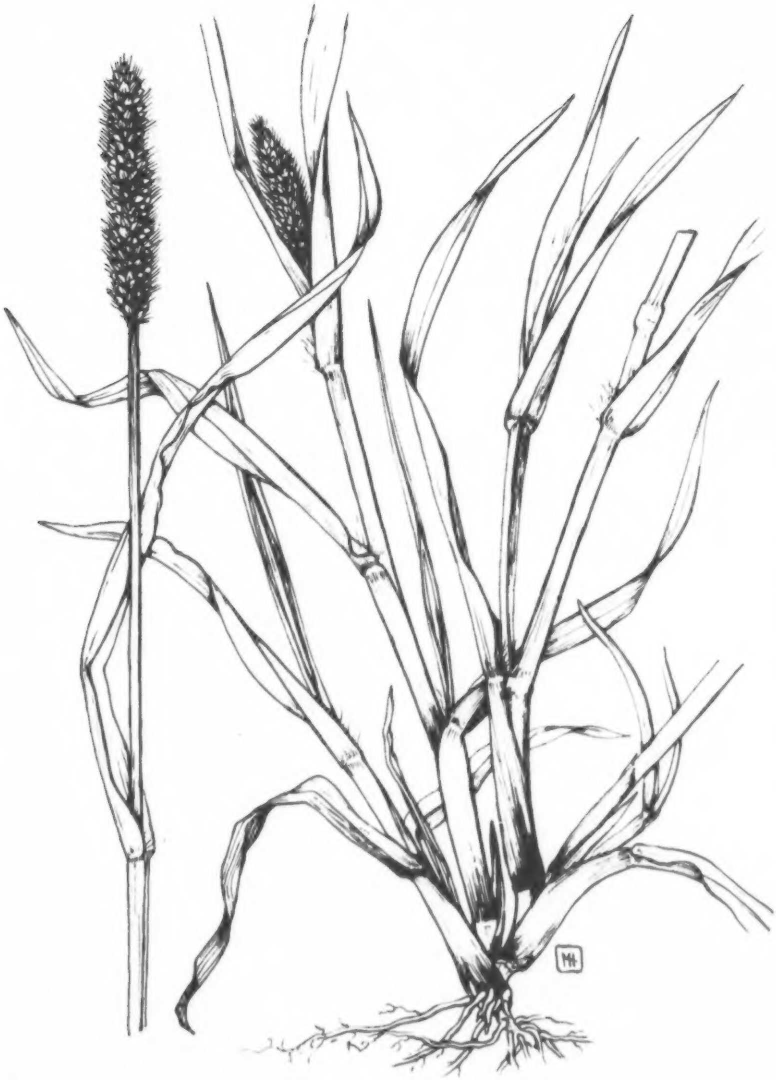


Fig. 28. *Setaria glauca* (L.) Beauv.

1. *Setaria glauca* (L.) Beauv. (*S. lutescens* (Weigel) Hubbard)

Fig. 28, Plate 68, Maps 249 and 250

yellow bristle grass

A common weed throughout the agricultural land of the southern counties, *Setaria glauca* is especially abundant in the region from York to Essex and Lambton counties, where corn and other grains are more extensively grown. Some of the earliest specimens are from Belleville in 1871, Ottawa in 1879, London in 1880, Snelgrove, Peel District in 1890, Galt (now Cambridge) in 1895, and Queenston in 1896.

Although it was found at Timmins in 1952 and there are four other records from northwestern Ontario, it is apparently rare in that region. It is evident that the weed either has not reached or is unable to survive in the more northerly agricultural regions, because no specimens are known from the areas around North Bay, Sudbury, Muskoka, the Bruce Peninsula, and Sault Ste. Marie.

Depauperate forms less than 15 cm high with solitary and few-flowered panicles are frequently encountered in poor pastures and on dry soils. Such plants are sometimes referred to as var. *pumila* (Poiret) Hegi, but they are merely phenotypically dwarfed by severe conditions of drought, low soil fertility, strong competition, or late season development. The erroneous use of the name *S. lutescens* for this species is discussed in McNeill and Dore (1977).

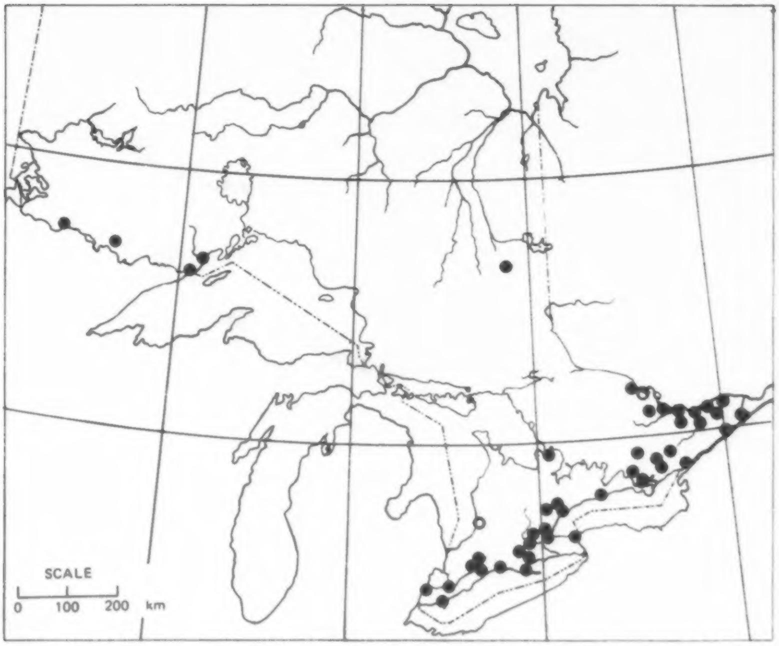
2. *Setaria viridis* (L.) Beauv.

Fig. 29, Plate 68, Maps 251–253

green bristle grass, green foxtail

A common weed throughout the settled portion of the province, *Setaria viridis* occurs in gardens, barnyards, fields, along roadsides, in dumps, and in waste places. It was known in Montreal in 1834, but the earliest Ontario specimen is that of Billings who, in 1860, reported it as "very common" at Prescott. It was also prevalent before 1900 at such points as Ottawa and Belleville (1876), London (1879), Hamilton (1892), Kingston (1893), Galt (now Cambridge) and Smith Falls (1894), and Queenston (1896).

Specimens are available from almost every county in the southern portion of the province except for a block in Grey, lower Bruce, Huron, Perth, upper Wellington, and Dufferin counties where the weed is thought to be absent or rare. One collection only is listed in the survey of the Batchawana Bay area, Algoma District (Taylor 1938), and no other speci-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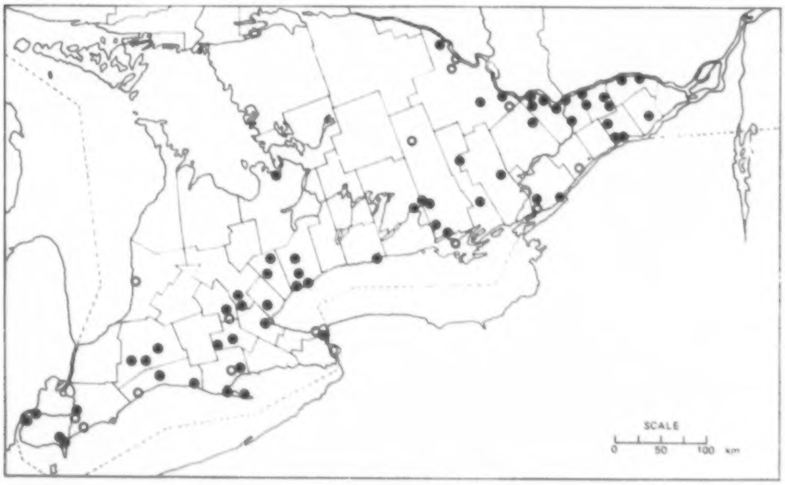
Map 249. *Setaria glauca*. For detail of distribution in southern Ontario, see Map 250.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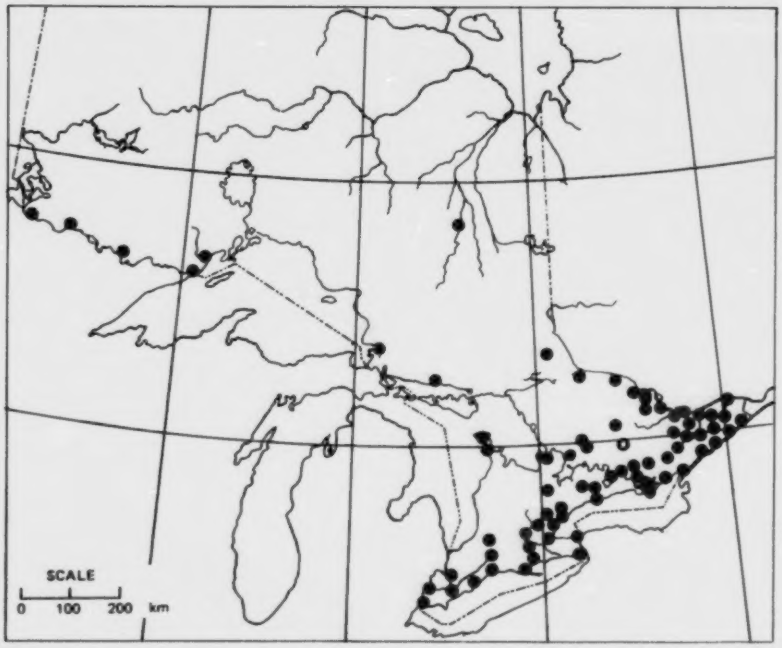
Map 250. *Setaria glauca*. Detail of distribution in southern Ontario; for general distribution in Ontario, see Map 249.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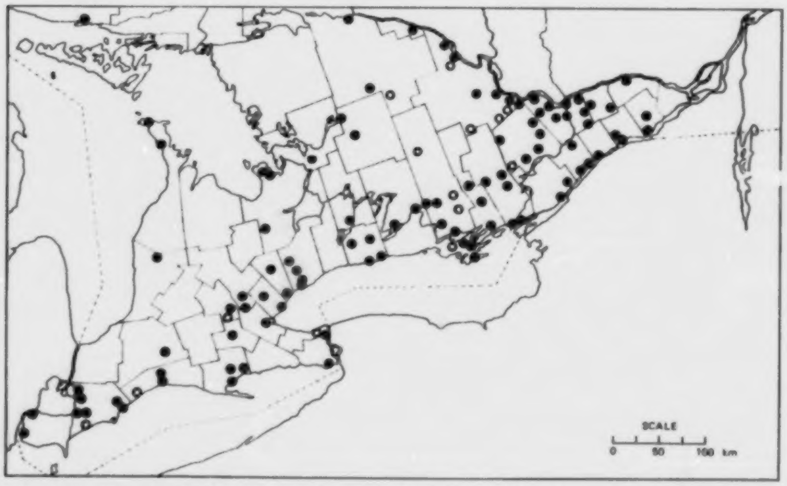
Map 251. *Setaria viridis* var. *viridis*. For detail of distribution in southern Ontario, see Map 252.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Map 252. *Setaria viridis* var. *viridis*. Detail of distribution in southern Ontario; for general distribution in Ontario, see Map 251.

mens are available from the Lake Superior region. It is, however, more abundant than *S. glauca* in the Fort Francis–Rainy River area, and westward into Manitoba it is essentially the only species present. It has not been collected, however, around North Bay, Sudbury, or Cochrane and, except for a 1952 collection at Kapuskasing, it is not known at other places to the north where other weedy species are common.

The species is rather polymorphic and a number of variants can be recognized among Ontario plants. Although some of these seem genetically based, others are certainly the result of phenotypic plasticity. Although no formal taxonomic treatment is proposed, two varieties seem distinguishable.

Plants that are considered typical of the species (var. *viridis*) are 30–60 cm high, upright, with some ascending branches from the upper nodes, and have leaves about 1 cm wide. The spikelet mass is about 1 cm thick, and the green bristles extend 5–10 cm beyond the spikelets, which are usually 2.2–2.3 cm long. This variety is common in gardens, grainfields, and dumps. Similar plants in which the bristles and often the spikelets are purple occur occasionally in widely scattered locations. This color form does not seem to have been named; the epithet *purpurascens* used by a few authors, although appropriate, appears to apply to plants of the following variety.

Plants are commonly found that are 10–30 cm high, with abundant spreading branches at the base, and leaf blades only 2–5 mm wide. These are best referred to var. *weinmannii* (Roemer & Schultes) Heuffel (var. *breviseta* auct.); Fernald & Wiegand (1910), Dore (1959). The panicles of such plants are 1.5–3 cm long and about 0.5 cm across the spikelet mass and are more sparsely flowered than in those of var. *viridis*. The spikelets are usually 1.9–2 mm long and the bristles extend only 1–3 mm beyond the spikelet. Although the bristles are green, they sometimes become purplish or drab at maturity, and a few stands with reddish tinged spikelets, even at flowering time, have been encountered. The purple coloration that develops in the older panicles, and that has been stressed in the characterization of var. *weinmannii*, seems of less significance than the spreading habit and the narrow blades.

These plants grow with var. *viridis* in gardens, grainfields, railway cinders, and dumps under similar conditions, and are thought to represent a genetic segregate rather than a phenotypic response. In addition to these habitats the variety also occurs in hayfields, along roadways, on railways, in pastures, and along paths where mowing and other mechanical agencies tend to eliminate the taller phenotypes from the population. It is found mainly in the southeastern counties.

Other variants are probably a reflection of phenotypic plasticity or unusual growth conditions. These include very small plants up to 10 cm in height with one or few panicles 1–1.5 cm long, and small leaves. Such plants, which have been called f. *pygmaea* (Ascherson & Graebner) Junge,

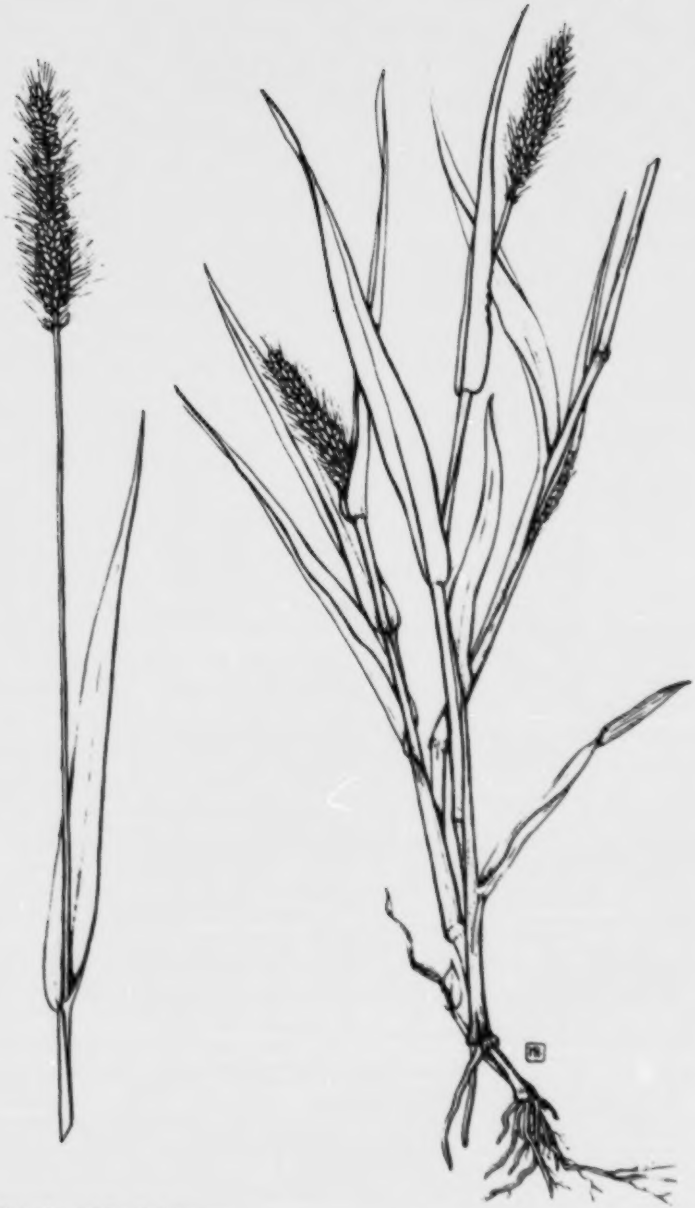
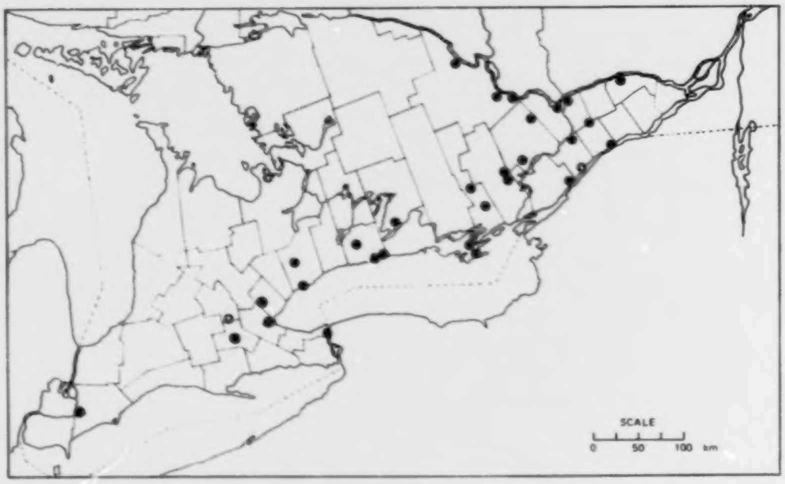


Fig. 29. *Setaria viridis* (L.) Beauv.



Map 253. *Setaria viridis* var. *weinmanni*.

are sometimes found in dry, poor soils or in pastures in which they are subject to severe growth conditions. Plants with forked, divided, or even segmented panicles have occasionally been collected. These characters are not maintained in the progeny raised from seed and the variants are of no taxonomic significance. The same is true of other plants, collected a few times, in which the spikelets proliferate into green scales, although these have been called var. *vivipara* (Bertol.) Parl.

3. *Setaria italica* (L.) Beauv.

Fig. 30

foxtail millet

Unknown in a wild state except as a weed escaped from cultivation, *Setaria italica* is cultivated throughout warm temperate regions for its grain and as a hay, pasture, and green fodder crop. As a grain crop it is particularly important in Asia, but the North American use is principally for forage of one type or another, although it is also an important component of bird seed.

The species is very variable with many different strains selected for different agricultural purposes. German millet with dense cylindrical heads and purple awns has been grown in Ontario and the cultivar Empire was developed and released in 1937 by the Canada Department of Agriculture in

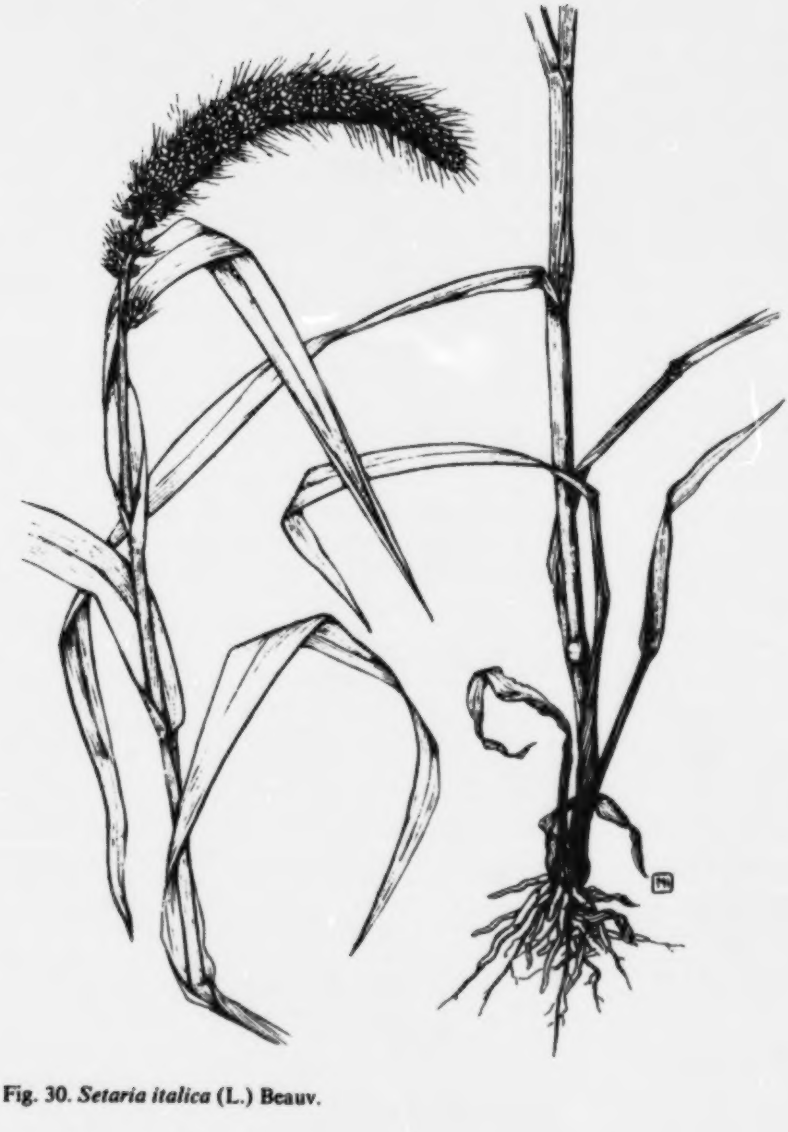


Fig. 30. *Setaria italica* (L.) Beauv.

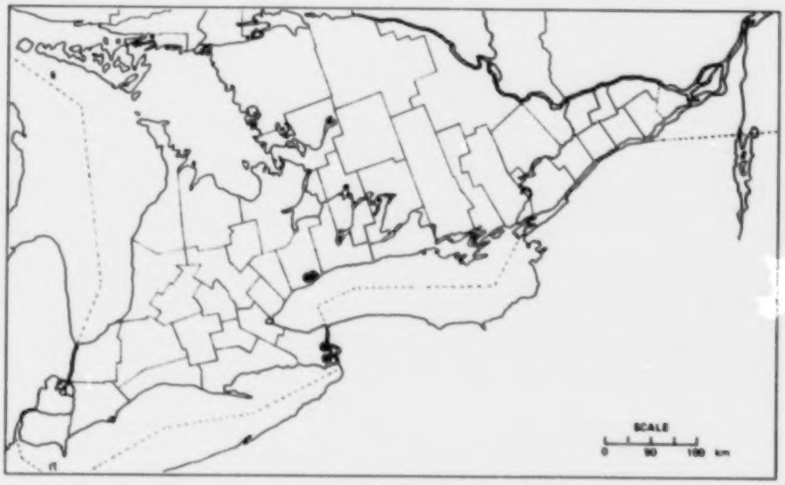
Ottawa. The species is not widely cultivated today, but plants do spring up from stray grains in cultivated fields, barnyards, and dumps, but do not seem to persist in Ontario from year to year as weeds.

4. *Setaria faberi* W. Herrmann

Map 254

giant bristle grass, giant foxtail

Setaria faberi was introduced into North America around 1930 and has since become a very serious field weed in Illinois, Missouri, and some adjacent states. The species occurs throughout all but the northernmost and southernmost parts of the eastern half of the United States. It has recently been found in Canada (Catling et al. 1978) and already several collections are known. Some of these are from railway yards or beside railway tracks: three in the Toronto area and two in the Niagara region. Others, however, are from fields and the species appears to be particularly frequent in the agricultural areas near Lake St. Clair in Kent County.



Map 254. *Setaria faberi*.

The features distinguishing *S. faberi* from the widespread *S. viridis* are discussed by Fairbrothers (1959) and Pohl (1962). The former species is tetraploid ($2n = 36$) and the latter diploid.

5. *Setaria verticillata* (L.) Beauv.

Plate 68, Map 255

bristly foxtail, bur bristle grass

Scabrous bristles; rachis and upper part of culm with downward pointing barbs..a. var. ***verticillata***
Scabrous bristles; rachis and culm with upward pointing barbs..........b. var. ***ambigua***

5a. var. *verticillata*

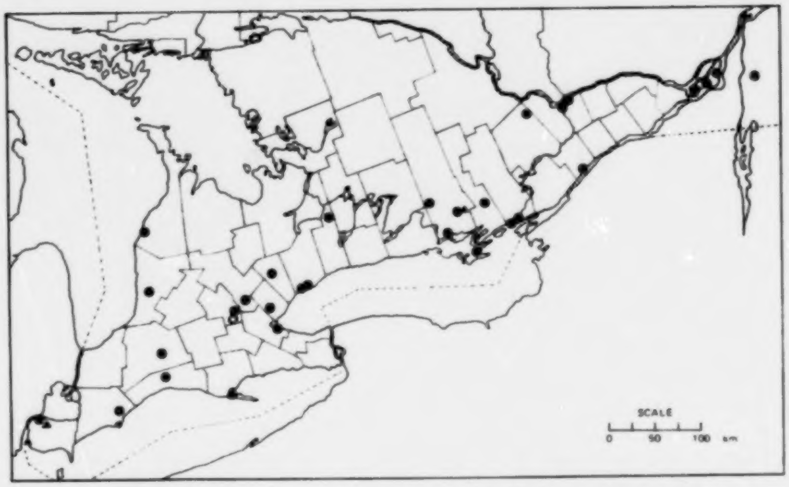
Setaria verticillata var. *verticillata* is readily distinguished from other taxa of *Setaria* by its harsh panicles that tend to tangle and cling tenaciously to clothing.

Although first noted in Ontario soon after the start of the century, the taxon has not yet spread as widely as *S. viridis* and *S. glauca*. Most of its occurrences have been along city streets and in gardens where it has probably been carried on clothing and on the fur of household pets. It also arrives in gardens in the soil with bedding plants and, proving a troublesome weed, finds its way to refuse dumps.

The first authentic Canadian specimen appears to be that from McGill College grounds, Montreal, collected by J. Fletcher in 1882. In Ontario, it was first known from a collection by J. Dearness at London in 1902. It had been recorded by Gibson and Macoun (1875) in their list of plants from the east coast of Lake Huron, but this was erroneous in view of J. M. Macoun's 1903 statement that "other specimens in our herbarium which have been referred here prove to be not this species." Whether this also covers the reports in Macoun's *Catalogue* (1888) for Belleville, Toronto, Hamilton, and Owen Sound is not certain, but no specimens from these sites prior to 1902 have been found. Several specimens were collected in Toronto after 1904, in 1937 at Hamilton, and in 1944 at Belleville. No specimens have been seen from Owen Sound and one from Kincardine, 80 km away, was not collected until 1947. Most of the spread in Ontario has taken place since 1940.

5b. var. *ambigua* (Guss.) Parl. (*S. viridis* var. *ambigua* (Guss.) Cosson & Durieu)

Var. ***ambigua*** was first collected in Ontario in 1948 in a riverside dump at Amherstburg and in the streets of Windsor, and found again in 1951 at Tweed, Hastings County; in the latter two sites it was growing with the typical variety.



Map 255. *Setaria verticillata* var. *verticillata* (•) and var. *ambigua* (▲). An open circle (○) indicates literature reports and other records not substantiated by a specimen; in those cases the variety involved is not known. All known Canadian records from the area covered by the map are plotted.

In most specimens of both varieties the bristles are scarcely longer than the spikelets, but in that of var. *ambigua* from Amherstburg they are about three times as long as the spikelets. A purplish color sometimes develops in the bristles and spikelets especially as the panicles age.

The relationship of this variety is undoubtedly with *S. verticillata* and not *S. viridis* as indicated by Gleason (1952) in the *New Britton and Brown Illustrated Flora*.

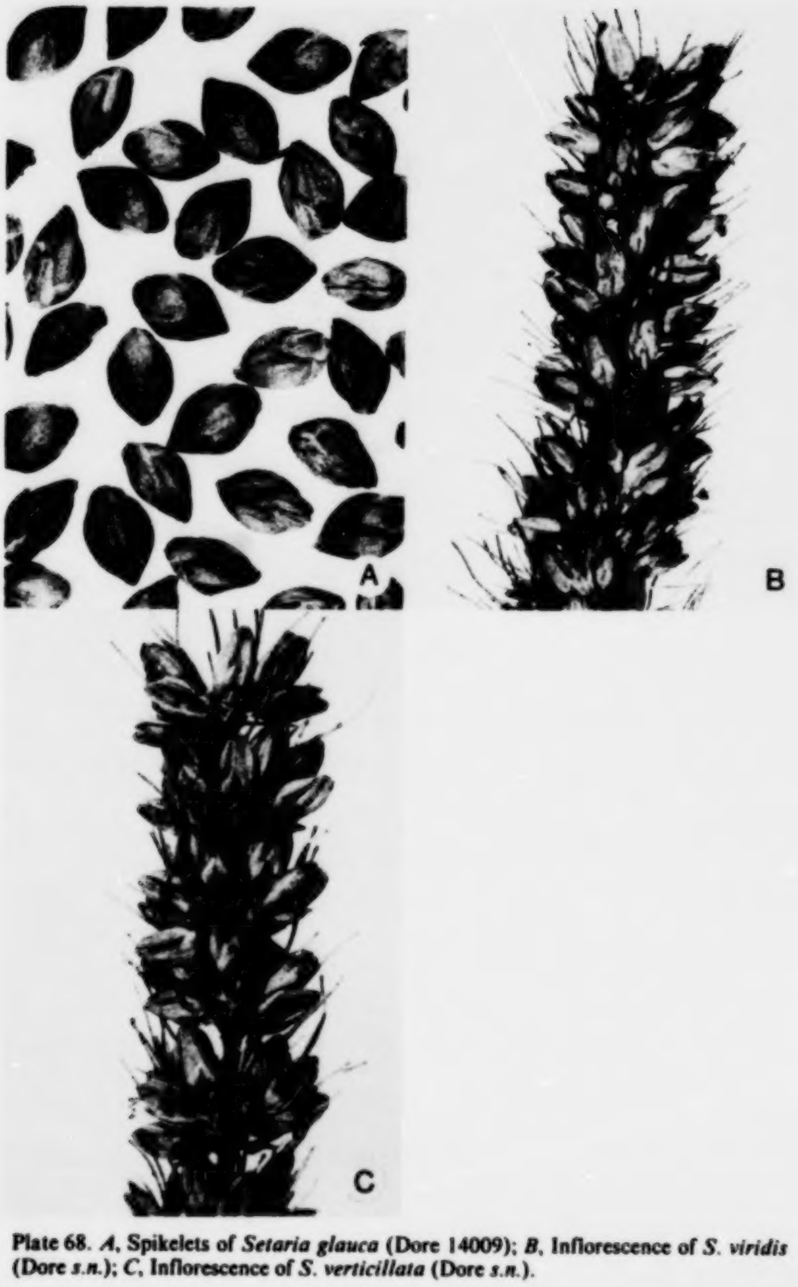


Plate 68. *A*, Spikelets of *Setaria glauca* (Dore 14009); *B*, Inflorescence of *S. viridis* (Dore *s.n.*); *C*, Inflorescence of *S. verticillata* (Dore *s.n.*).

72. Pennisetum L.C.M. Richard ex Pers.

Large tropical or subtropical grasses similar to *Setaria* but with the spikelets falling with their subtending bristles attached.

The following species have been grown in Ontario but none persist.

Pennisetum typhoides **(Burm. fil.) Stapf & C.E. Hubbard (*P. glaucum* auct.)** —This species, called pearl millet, is a tall leafy annual, cultivated for many years in tropical countries for its grain. It is now grown in the southern United States for forage. It is widely known as *P. glaucum* (L.). R. Br., based on *Panicum glaucum* L., a name better typified by a plant of yellow bristle grass, *Setaria glauca* (L.) Beauv. Only a specimen in a preflowering stage from experimental cultivation at Guelph in 1920 is known from Ontario.

Pennisetum setaceum **(Forskal) Chiov.**—This species (fountain grass), sometimes known by horticulturists as *P. ruppelii* Steudel, is an ornamental species often set out in formal beds, usually in combination with cannas, to enhance our city parks. Its long, spike-like panicles are soft and purplish, resembling a dense bottlebrush. It is a perennial, but because it is not hardy, the plants must be brought into a heated house for the winter, or grown from seed each year. Specimens indicate that it has been grown in ornamental beds at Morrisburg, Ottawa, Guelph, Hamilton, and St. Catherines.

Pennisetum villosum **R. Br.**—This species is similar to the above, but the bristles are longer and whitish, and the spikes shorter. It is not so widely grown, but a specimen records its cultivation as an ornamental at Guelph in 1937. The species tends to escape and become a weed in some parts of the southern United States.

73. Cenchrus L.

Plants annual, with spreading branches sometimes rooting at the nodes. Foliage scabrous; sheaths loose and keeled, pilose at the throat, but otherwise hairless; ligule a row of short hairs. Panicle a loose raceme of bur-like heads, about 1 cm across, at the end of the stems. Burs hardened, subglobular involucres of sharp barbed spines (sterile branches) fused together and enclosing 2 spikelets similar in structure to those of *Panicum*.

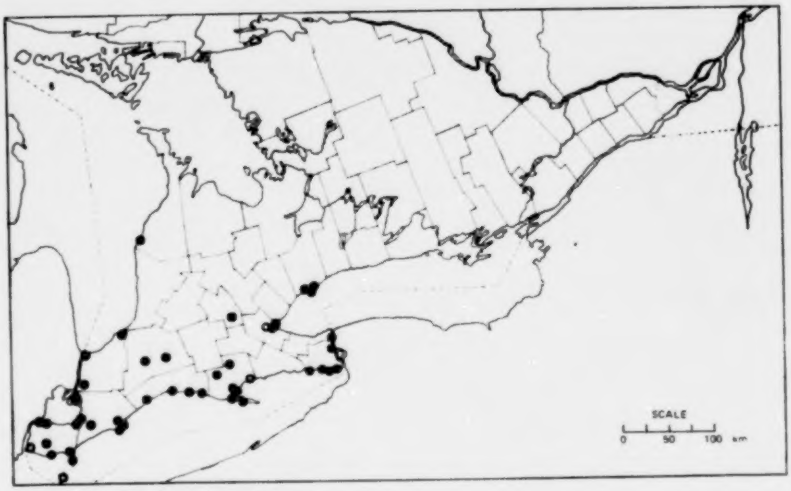
Although the spikelet structure is not easily discerned because of the difficulty in dissecting the hard bur, the genus is in fact readily recognized by these burs with their irritating sharply barbed spines.

1. *Cenchrus longispinus* (Hackel) Fernald (*C. pauciflorus* auct.)

Plate 69, Map 256

long-spined sandbur, sandbur

Before European settlement, *Cenchrus longispinus* seems to have been present, if anywhere in Ontario, only along the upper sandy beach ridges of Lake Erie. It is a readily recognized grass, yet it was not recorded for Canada by Hooker (1840), who had information from the surveys by Douglas in the Windsor area and McNab in the Sarnia and St. Clair River areas. McNab did encounter it in 1834 at "Lake Erie," but at a locality now known to be Cleveland on the south shore of the lake. The earliest Canadian record is that of Maclagan in the 1850s, from the "shores of Detroit River, C.W." (Lawson MS), near its mouth at Amherstburg. Maclagan also collected at Niagara but did not find sandbur there, nor did McNab in 1834, or Lawson in 1857; the first record for that area is by Scott in 1896, who found it "by the railway," which suggests that the plant was a recent introduction. Macoun (1888) reported sandbur as "introduced along railways in a few localities" and cites the record of Logie in the 1860s "Great Western Railway, a mile east of Dundas." It was first collected at London in 1902 "along the railway." Earlier records from the Lake Erie shore, 1880 at Port Colborne, 1881 at Leamington, and 1886 at Rondeau, seem to suggest indigenous occurrence, but on the other hand, there had been considerable traffic to these points by that time. The species was found at Port Stanley in 1895, but not until 1940 at Long Point.



Map 256. *Cenchrus longispinus.*

The burs adhere readily to clothing and camping gear, and the species is now common in sandy areas around popular beaches and has spread into adjoining fields and roadsides. The grains inside the burs may remain dormant for a few years if deeply buried in the soil, or if conditions are not immediately suitable for their germination. The known stations in Ontario are fully detailed by Soper (1962), and the overall distribution in North America is shown by DeLisle (1963). Under greenhouse conditions seedlings tend to continue growth vegetatively without producing inflorescences.

Cenchrus longispinus has been known in Canada under a variety of names because of confusion with other species. These include *C. echinatus* L. (early reports), *C. tribuloides* L. (Macoun's *Catalogue*), *C. carolinianus* Walter (Gray's *Manual*, early editions), and *C. pauciflorus* Bentham (Hitchcock's *Manual*). DeLisle's (1963) account of the genus clarifies the delimitation and distribution of these species.

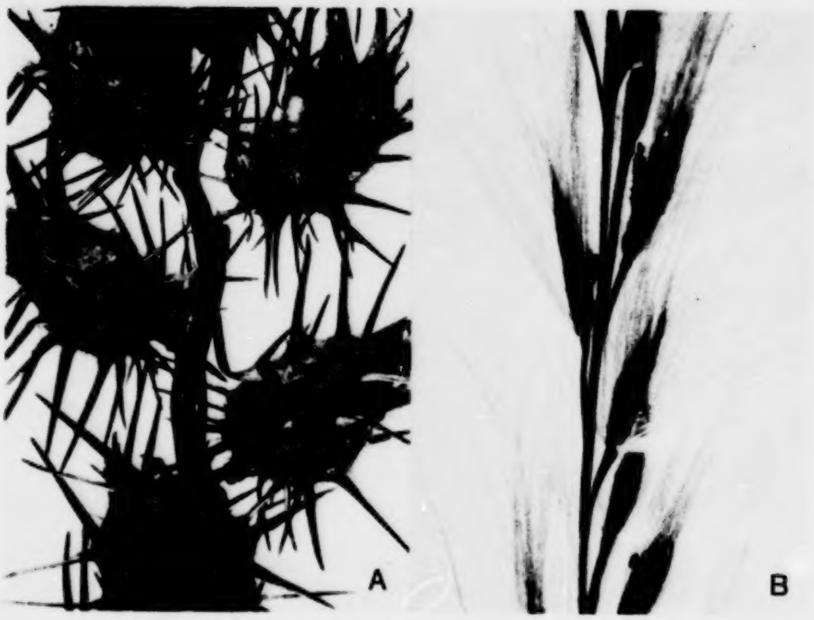


Plate 69. *A*, Detail of inflorescence of *Cenchrus longispinus* (Groh in 1936); *B*, Spikelets of *Miscanthus sacchariflorus* (Gillett 10688).

74. Miscanthus N.J. Andersson

Tall perennial grasses. Leaf blades hairless, sharply serrate with a broad whitish midrib; ligule membranous with hair-fringed margin. Inflorescences large, plume-like, made up of slender silky racemes diverging in fan fashion from top of the stems. Spikelets 2 at each node of the axis, both perfect, similar in structure and pediceled; the pedicel of one more than twice the length of the other. Glumes firm, slender, long-hairy on the back particularly toward the base; sterile lemma membranous, awnless, or dorsally awned.

Lemma awnless .... 1. ***M. sacchariflorus***
Lemma awned .... 2. ***M. sinensis***

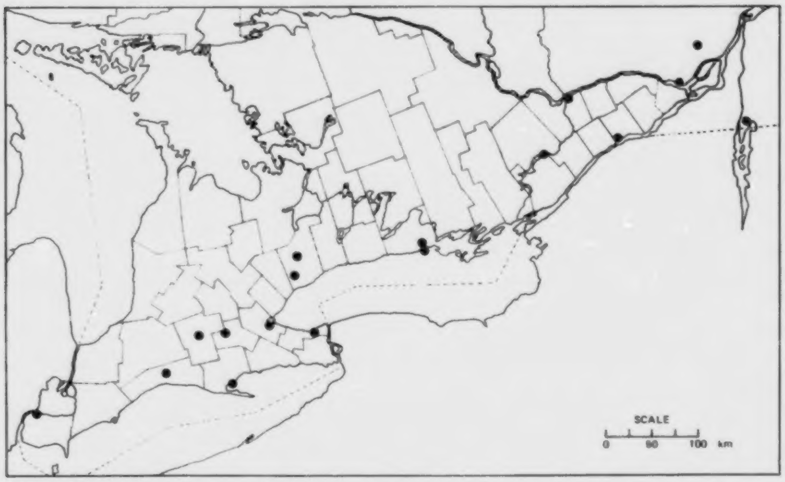
1. *Miscanthus sacchariflorus* (Maxim.) Hackel

Plate 69, Map 257

miscanthus

A tall, leafy ornamental grass currently popular in gardens, *Miscanthus sacchariflorus* stands 1.5–2 m high. Its late-emerging heads are suitable for winter bouquets because the racemes do not break up unless harvested in an overmature condition. The soft silvery hairs of the spikelets cause the rays of the inflorescence to spread out in feathery fashion. The plants have deeply spreading and coarse rhizomes that form rapidly expanding patches. These tend to get out of hand and invade moist land, often ditches, adjacent to gardens; plants also appear in dumps from discarded root masses.

The first specimens known to have been collected in Ontario are from Hamilton in 1943; these were originally misidentified as *Cortaderia argentea*. Since 1952, however, miscanthus has been found unattended at several sites in Ontario such as Aultsville near Ingleside, Stormont County, Smiths Falls, Lanark County, Brighton, Northumberland County, Woodbridge and Aurora, Regional Municipality of York, Falkland, Brant County, Woodstock, Turkey Point, Regional Municipality of Haldimand-Norfolk, and St. Thomas. It is also known at Clarenceville and Joliette in Quebec. Some of these infestations are of large size, and excessively vigorous or weedy



Map 257. *Miscanthus sacchariflorus*. All known Canadian records from the area covered by the map are plotted.

patches have been found in gardens at Ottawa, Hamilton, St. Catherines, and Windsor. Others must certainly occur elsewhere because the plant is easy to propagate, making it readily distributed through gifts to friends.

Since this species of *Miscanthus* has generally not been treated in detail in horticultural manuals, various local names have been coined. "Plume grass" is a common one, and "Canadian pampas grass" has been used in the catalogues of Woodland Nurseries, Cookville. In Ontario the plants flower freely and have large, dark purple anthers, but good seed has not been seen, probably because the plants are self-incompatible and are represented by a single clone in any one place. In parts of the United States where the spread of miscanthus has caused some concern, there is, however, some indication that reproduction is by seed (Pohl 1963).

The species is native to the Amur region of eastern Siberia, and to China and Japan.

2. *Miscanthus sinensis* N.J. Andersson

eulalia

Miscanthus sinensis is distinguishable from *M. sacchariflorus* by its less silky panicle, shorter spikelet hairs, awned fertile lemmas, and more yellow or pink color. This old-fashioned garden plant has been grown to the flowering stage at Guelph and London but its winterhardiness is not recorded. There is no evidence of it escaping to wasteland in Ontario as it does in the Central Atlantic States.

75. Andropogon L. (incl. *Schizachyrium* Nees)

Tufted perennials with solid, hard, and brittle culms. Foliage and culms generally glaucous and often purple-colored; ligule membranous with hair-fringed margin. Inflorescence of racemes, at the end of the culm and the numerous branch culms, enclosed in the inflated bladeless sheaths until midsummer. Spikelets in pairs at each node of the jointed rachis, one sessile and fertile, the other reduced to a sterile rudiment at the tip of a flattened, clavate, and conspicuously bearded pedicel. Glumes of fertile floret hard, narrow, awnless. Lemma of fertile floret hyaline, bifid with a bent and twisted awn from between the teeth; lemma of sterile floret hyaline, shorter than the glumes.

- A. Racemes 2–3 cm long, 2–4 together, partially included by and shorter than subtending spathe; sessile spikelet about 3 mm long; pedicellate spikelet absent, represented only by the villous pedicel .... 3. ***A. virginicus***
- A. Racemes 3–10 cm long, greatly exceeding the subtending leaf or leaf sheath; sessile spikelets 6–10 mm long; pedicellate spikelet similar to the sessile one or represented by an awned glume
  - B. Racemes solitary on filiform peduncles at the end of the culm and of the numerous (>5) lateral branches; pedicellate spikelet represented by an awned glume; plants generally less than 70 cm high .... 1. ***A. scoparius***
  - B. Racemes 2–5 on robust peduncles at the end of the culm and of the few lateral branches; pedicellate spikelet similar to the sessile one; plants generally more than 90 cm high .... 2. ***A. gerardii***

1. *Andropogon scoparius* Michaux (*Schizachyrium scoparium* (Michaux) Nees)

Plate 70, Map 258

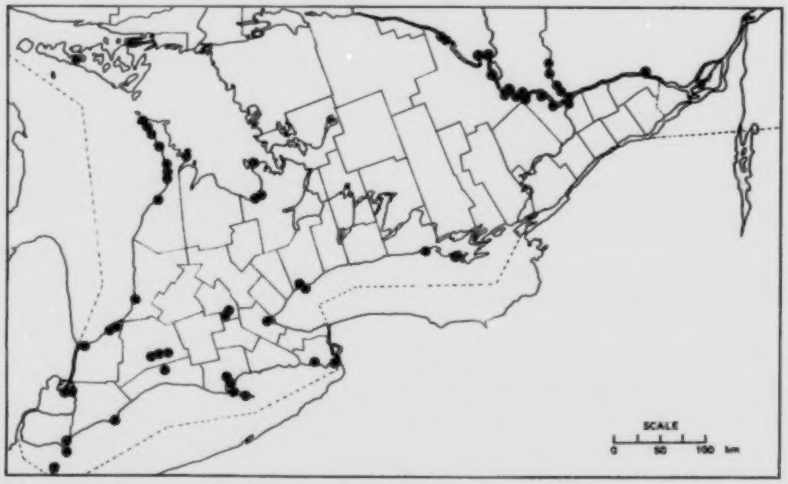
little bluestem, prairie beard grass

A characteristic grass of the native prairie to the southwest, *Andropogon scoparius* is largely restricted in its distribution in Ontario to the sand dunes and dry rocky shores of Lake Huron, Lake Erie, and the Ottawa River, although it does occur in a few inland stations in the southwestern peninsula.

The species is moderately variable but existing infraspecific classifications, including the most elaborate one of Fernald and Griscom (1935), are not altogether satisfactory. Two or possibly three variants are, however, distinguishable in Ontario.

The common variant has flexuous racemes and essentially hairless foliage and agrees well with the description of var. *septentrionalis* Fernald & Griscom, whose type specimen is cited as "Baie Sherley, Riv. Ottawa, Quebec, 15 sept. 1925, Rolland, no. 19,199." Shirleys Bay, the type locality, is actually in Ontario on the south side of the Ottawa River a few kilometres above Ottawa. The variant is equally abundant on both shores and extends upstream as far as the islands at Chalk River in Renfrew County. It has not yet been collected beyond this point at the several well-worked sites along the upper Ottawa and Mattawa–Lake Nipissing drainage systems. It is also the common variety along Lake Huron (the Cloche Peninsula, the Bruce Peninsula, Wasaga Beach, St. Joseph, and Grand Bend), on the dry parts of the islands in Lake St. Clair, at Point Pelee, Leamington, and Pelee Island, at Port Colbourne and Erie Beach, and in High Park and on Toronto Island at Toronto. Inland points are at Komoka and Cambridge (Galt). It has also been collected at Thunder Bay at the head of Lake Superior.

A few specimens from Long Point, Point Pelee, and Wasaga Beach have stricter racemes, broader pedicels, larger sterile spikelets, and sharply keeled sheaths. These belong to var. *littoralis* (Nash) A.S. Hitchc. (*A. littoralis* Nash), although Fernald and Griscom (1935) refer such plants to



Map 258. *Andropogon scoparius* (all varieties). All known Canadian records from the area covered by the map are plotted. The species has also been collected at Thunder Bay in northern Ontario.

var. *neomexicanus* (Nash) A.S. Hitchc. However, measurements given by them for var. *neomexicanus* do not exactly apply to the Ontario plants. A few other collections from Wasaga Beach have densely villous foliage such as that characteristic of var. *villosissimus* Kearney ex Scribner & C.R. Ball. This variety is included with the typical variety by Fernald and Griscom (1935). The Wasaga Beach plants, however, do not agree with the other characteristics of var. *scoparius* as circumscribed by Fernald and Griscom, but are more similar to var. *littoralis*.

The genus *Andropogon* in the broad sense used here (following Hitchcock and Chase 1951) is often subdivided into a number of segregate genera. When this is done, the species with only one raceme at the end of each culm or culm branch are placed in *Schizachyrium* (*see* Gould 1967).

2. *Andropogon gerardii* Vitman

Plate 70, Map 259

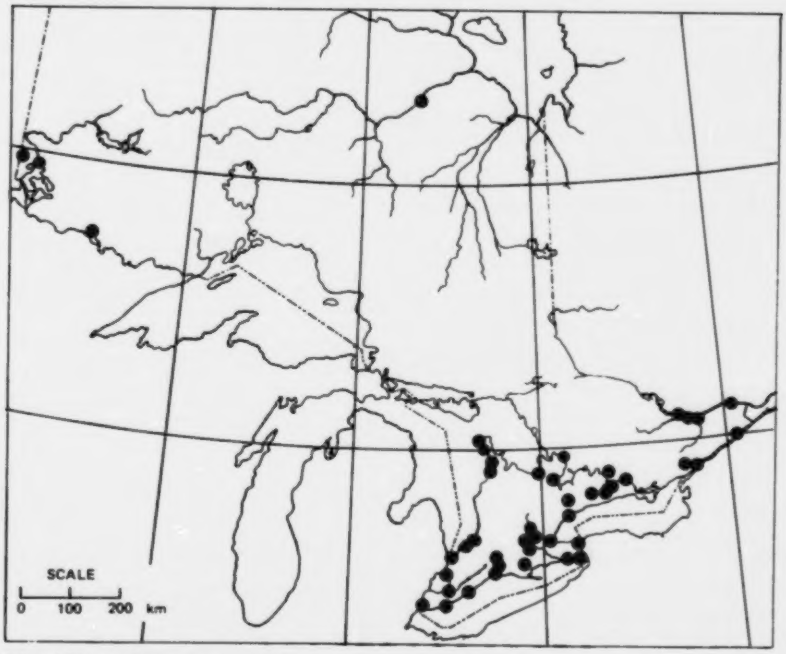
big bluestem, bluejoint turkeyfoot

A tall, glaucous, and generally deep purple species characteristic of the tall-grass prairie of the midwestern States, *Andropogon gerardii* extends into Ontario at the Manitoba boundary near Ingolf. Then, after a long break, it is found along the shores of Lake Huron from the tip of the Bruce Peninsula southward to the shores of Lake St. Clair and Lake Erie where it is found at Point Pelee and Rondeau, but not at Long Point. It is also present on or near the shores of the Ottawa River in the Regional Municipality of Ottawa-Carleton and in Prescott County, and along the Trent River at Healey Falls and Rice Lake.

Natural occurrences on dry sand plains or moranic hills at points away from the shores of lakes and major rivers are located in Wellington County, in the southern part of the Waterloo Regional Municipality and the adjacent part of Brant County, in central Norfolk and Middlesex counties, in High Park, Toronto, near Richmond Hill, Regional Municipality of York, at Pontypool in Durham County, and at Lake Opinicon, Leeds County. Some localities such as those at Cambridge (Galt), Kitchener, and Barrie are on railroad embankments and may represent local introductions. The apparent absence of the species at Long Point on Lake Erie and on the sand hills along the Lake Ontario shore is noteworthy. Some specimens from Toronto and Port Credit are not sufficiently annotated to determine whether they are related to lakeshore habitats or not.

One Ontario specimen collected by Soper at Point Pelee has golden yellow rachis hairs, which are somewhat denser and longer (2–2.5 mm long) than usual, and so possesses characteristics of var. *chrysocomus* (Nash) Fernald. The variety is of doubtful significance, however, because the white

75. Andropogon L.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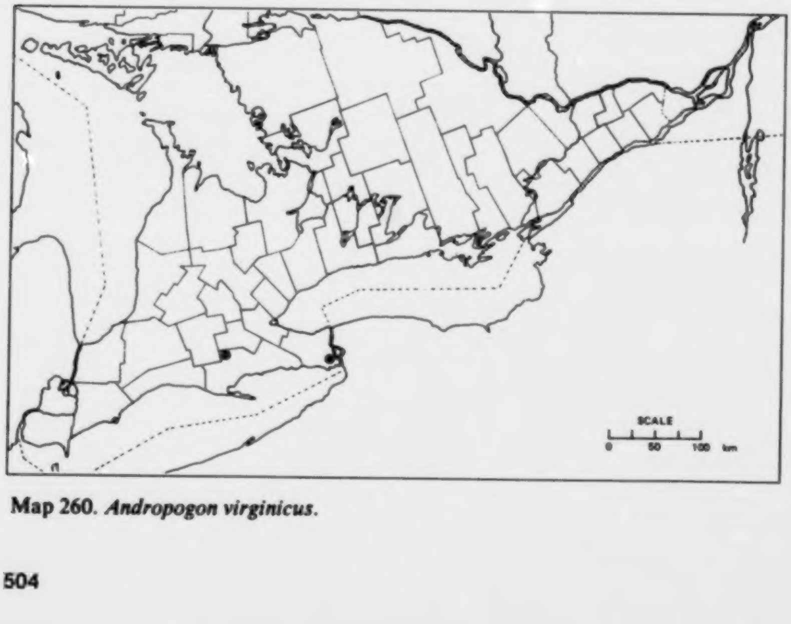
Map 259. *Andropogon gerardii.*


SCALE
0 50 100 km

Map 260. *Andropogon virginicus.*

or gray rachis hairs of typical plants are often just as long, and because another specimen (from Pontiac, Quebec on the shores of the Ottawa River) has very short, golden yellow hairs. Plants of var. *chrysocomus* are also supposed to have glabrous spikelets of hispid nerves but the hairiness of the nerve and internerve regions is inconsistent in both the plants with golden yellow hairs and those with gray-white ones.

3. *Andropogon virginicus* L.

Map 260

broomsedge

A widespread species of open ground and old fields in the eastern United States, *Andropogon virginicus* was first discovered in Canada in 1958 in relict prairie in Windham Township, Norfolk County. The specimens were mistaken for *A. scoparius*, until a second finding was made in 1976 in a railway yard in the Niagara area (Catling et al. 1978). Since then it has been found at several places in Kent and Middlesex counties.

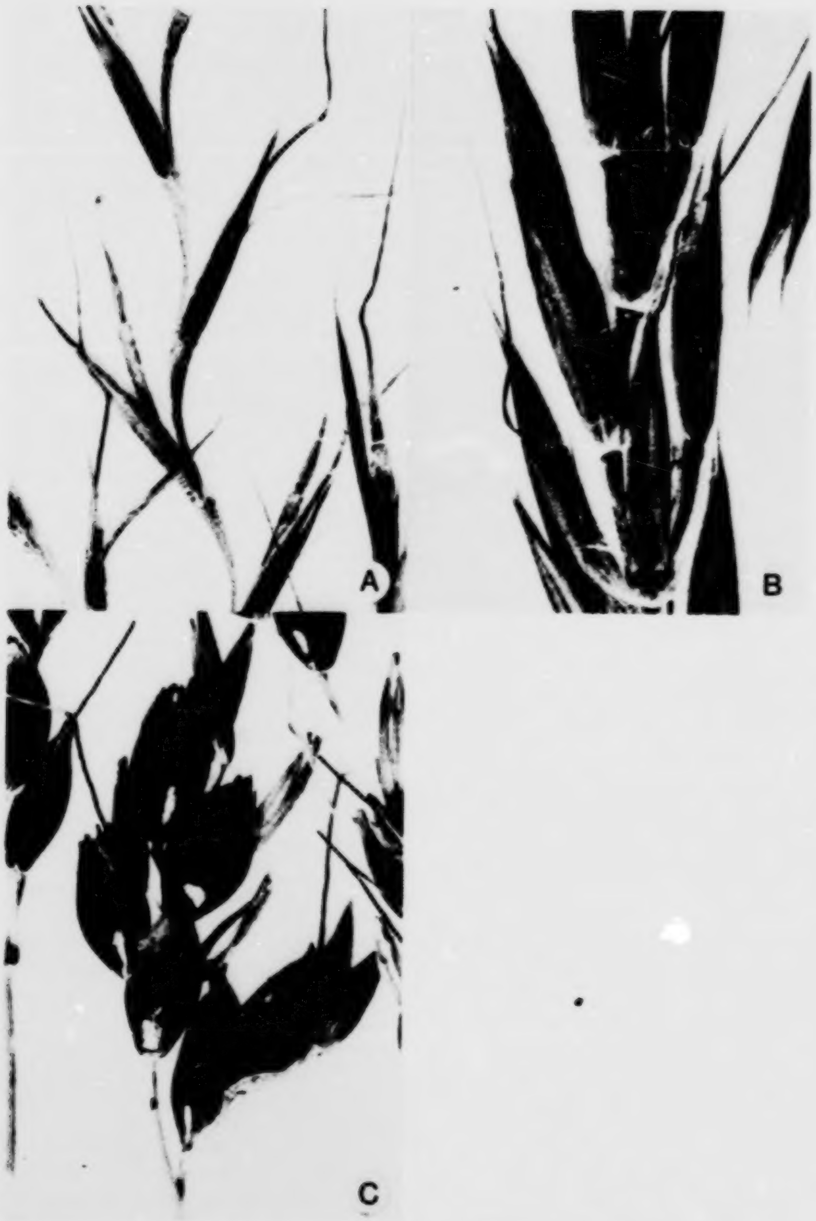


Plate 70. *A*, Spikelets of *Andropogon scoparius* (Dore 15534); *B*, Spikelets of *A. gerardii* (James 1581); *C*, Spikelets of *Sorghum bicolor* (Gaiser 2456).

76. Sorghum Moench

Tall and often stout annual or perennial grasses with flat leaf blades. Panicles terminal with 1–5 tardily disarticulating racemes. Spikelets in pairs, one spikelet sessile and fertile, the other pedicellate, well-developed, and staminate.

This is an important genus of cultivated plants throughout the tropical and warm-temperate regions of the world and comprises both grain and forage grasses (Doggett 1970). The cultivated grain sorghums are usually regarded as comprising the species *S. bicolor*, but hybridization is easily achieved between this group and wild and cultivated forage or weed sorghums such as *S. halepense* and *S. sudanense*. This has led De Wet and Huckabay (1967) to suggest that all the weed and cultivated sorghums be combined under the name *S. bicolor*.

A. Leaves more than 2 cm wide; culms more than 1 cm thick, pithy; grains exceeding glumes, exposed; plants annual .... 1. ***S. bicolor***
A. Leaves less than 2 cm wide; culms less than 1 cm thick, without extensive pith; grains enclosed by the glumes
    B. Plants annual, without rhizomes; sessile spikelets 6–7.5 mm long; rachis tough, the mature sessile spikelets rather persistent .... 2. ***S. sudanense***
    B. Plants perennial, with creeping scaly rhizomes; sessile spikelets 4.5–5.5 mm long; rachis fragile, the sessile spikelets deciduous when mature .... 3. ***S. halepense***

1. *Sorghum bicolor* (L.) Moench (*S. vulgare* Pers.)

Plate 70

sorghum, grain sorghum, sweet sorghum, milo, sorgo

Sorghum bicolor is grown sparingly but successfully in the "corn-belt counties" of southwestern Ontario, where it is cut for ensilage or poultry feed. Sometimes stray plants are found along field margins (e.g., in Lambton County, Gaiser and Moore 1966) or at bird feeding stations. The sweet or grain sorghums have stems that are almost as tall and coarse as corn, and contain sweet juice in some strains. They bear heavy panicles of congested spikelets.

Another group of cultivated sorghum is grown for the production of broomcorn; in these cultivars the panicle branches are very long, tough, and flexible. This sorghum is the source of quality broom fibers and is sparingly grown in the southwestern counties. It is not known as an escape.

The illegitimate name *S. vulgare* has been widely used for this species (*see* Shinners 1956).

2. *Sorghum sudanense* (Piper) Stapf

grass sorghum, Sudan grass

Sorghum sudanense is widely used as an annual forage crop in the southern United States. It was introduced as a replacement for Johnson grass (*S. halepense*) when that species' weedy propensities became evident. In Ontario it is planted in late season as an emergency forage crop, and either pastured or cut for green feed. Plants seldom attain mature grains except in the southern counties. They sometimes appear in dumps and waste places from stray seeds or in fields from deeply buried seeds of the previous year's sowing. Plants detected in wild areas (e.g., Long Point in 1963 and Loughborough Lake, Frontenac County, in 1966) apparently arise from grain placed out to feed or attract game birds such as partridge and pheasant.

Sudan grass is treated by Doggett (1970) as a variety of the widespread and variable African wild forage grass, *S. arundinaceum* (Desv.) Stapf; it is also often treated as a variety of the cultivated grain sorghum species.

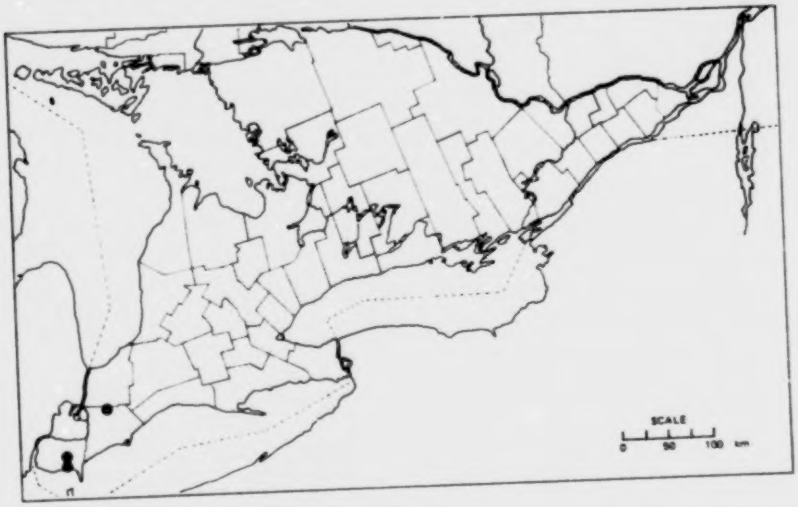
3. *Sorghum halepense* (L.) Pers.

Map 261

Johnson grass

An octoploid perennial species with extensive creeping rhizomes, *Sorghum halepense* is widely distributed in the Mediterranean region where it may have arisen by hybridization between two tetraploids, one a wild rhizomatous species and the other one of a number of wild or cultivated annuals or tufted perennials of the same group as the cultivated grain sorghums.

It was originally introduced into North America as a forage plant but has become a very serious weed because of its vigorous rhizomatous growth and in some areas by hybridizing with and contaminating seed stocks of grain sorghum (McNeill 1976*a*). Severe frost apparently prevents the rhizomes from surviving the winter, and this restricts the spread of the species in Ontario. It has, however, recently been found to occur as a weed in parts of the southwestern counties.



Map 261. *Sorghum halepense*.

77. Sorghastrum Nash

Coarse perennials with short rhizomes but tufted in habit, and with tall stems. Culm nodes upwardly fringed with stiff hairs. Leaf sheaths hairless (or the lower ones pilose), with erect auricles at collar; blades long, hairless; ligule membranous. Panicles terminal, large, contracted. Spikelets golden brown, sessile, each paired with a feather-like, fringed pedicel devoid of a spikelet at its tip. Glumes hard, yellowish brown and shiny, the lower inrolled and long-hairy. Lemmas very thin and transparent, that of the inner floret terminated by a twisted awn about 1 cm long.

Sorghastrum is often included within *Sorghum* as a subgenus.

1. *Sorghastrum nutans* (L.) Nash

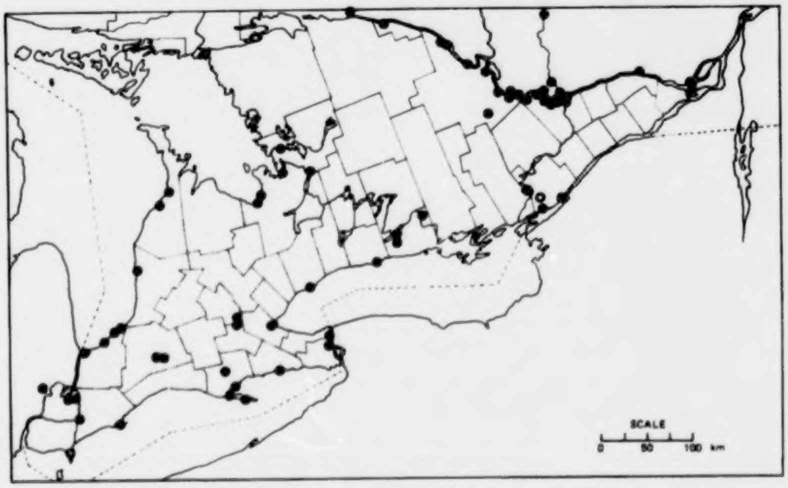
Plate 71, Map 262

Indian grass

A rather scarce grass in Ontario, *Sorghastrum nutans* is mainly confined to open sandy sites or the rocky places along the shores and beaches of the lower Great Lakes extending from Nottawasaga Bay and Sauble Beach on Lake Huron southward to Lake Erie and Lake Ontario, but along the St. Lawrence shores only as far as the Thousand Islands in Leeds County. Numerous localities are known on the flood shores of the Ottawa River from LaCave Rapids (8 km above junction of the Mattawa) down to Kettle Island at Ottawa; it is found again at the rapids at Grenville on the Quebec side, and at the head of certain islands of the Montreal group located in the Ottawa River. Indian grass is also at the limit of its northeastern range in the valley of the Gatineau River where scattered stands stretch 120 km upstream to Grand Remous. On other tributaries of the Ottawa River, a large patch is known at Hog's Back Rapids 5 km up the Rideau River and a single clump at Barrett Chute about 40 km up the Madawaska River, suggesting transport by man.

In the Trent River system, *Sorghastrum* is known from an island in Rice Lake and a dry cliff top at Healey Falls, on the bare rock at Severn Chute, and at Waubaushene. The early specimens collected in "Hastings

County" by Macoun, 1865 and 1874, probably come from the Healey Falls site. No specimens have been found to support the record for Point Pelee (Dodge 1914).



Map 262. *Sorghastrum nutans*.

Indian grass is characteristic of the tall-grass prairie of the central United States and southernmost Manitoba. In the Great Plains it is considered a useful range forage grass and several cultivars have now been made available for seeding. In Ontario, in contrast, the plant appears to be unproductive and, like the *Andropogon* species and other prairie plants with which it is often associated, is in danger of extinction.

Voss (1972*a*) gives the reasons for retaining the name *S. nutans* instead of adopting *S. avenaceum* (Michaux) Nash, as suggested by Baum (1967).

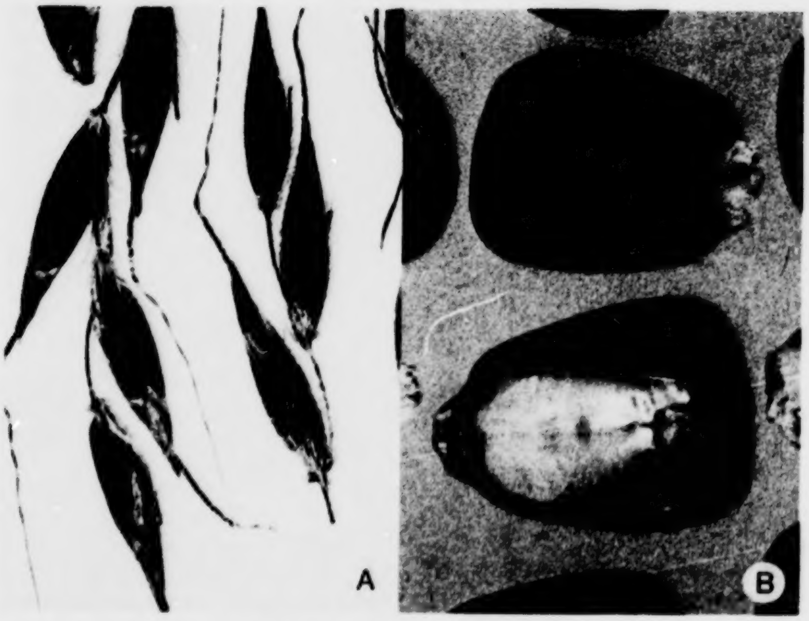


Plate 71. *A*, Spikelets of *Sorghastrum nutans* (Dore 18416); *B*, Caryopses of *Zea mays* (Dore in 1965).

78. Zea L.

Stout annual grasses with pith-filled culm and broad coarse blades. Ligule short, membranous, closely fringed. Spikelets unisexual; the staminate in a terminal panicle of racemes known as the tassel; the pistillate in 1 to few lateral spikes known as the ear, surrounded by tight husk-like leaves with much reduced blades. Staminate spikelets in pairs, 2-flowered, with relatively soft, shortly hairy glumes and lemmas; pistillate spikelets in pairs, 2-flowered (1 usually abortive), with short chaffy colorless glumes and lemmas affixed to the axis (cob), usually in 8 rows; style very long, protruding from each ovary to the top of the husk as 'silk'.

1. *Zea mays* L.

Plate 71

corn, Indian corn, maize

Zea mays is extensively cultivated as a grain crop in the southwestern counties, as a forage crop for ensilage across all the southern counties, and as the vegetable sweet corn or corn on the cob in gardens over a wider area. It is also grown for oil, starch, and industrial products, for popping, for ornament, or for curiosity (e.g., for variegated foliage or multicolored grains), as well as for experimental study. Different cultivars have been developed and are available for the various purposes.

Ripe grains can withstand freezing in dry storage but are killed in the soil by winter conditions in Ontario. Archaeological remains indicate that maize of an advanced form was grown by the Indians of southern Ontario and Huronia long before their contact with Europeans.

Appendix I

Key to the abbreviations of certain authors' names

For abbreviations of other authors, *see* Tutin et al., eds., *Flora Europaea*, vol. 4:413–430; 1976. An asterisk (*) marks those few names for which we use an abbreviation different from that in *Flora Europaea*; these differences arise from our avoidance of contractions and from our adoption of the American National Standard for the transliteration of Cyrillic alphabets.

Abbe	Ernest Cleveland Abbe (1905–
Ashe	William Willard Ashe (1872–1932)
Austin	Coe Finch Austin (1831–1880)
Babel	William Keith Babel (1917–
Ball, C. R.	Carleton Roy Ball (1873–1958)
Barkworth	Mary Elizabeth Barkworth (1941–
Batchelder	Frederick William Batchelder (1838–1911)
Beal	William James Beal (1833–1924)
Biehler	Johann Friedrich Theodor Biehler (ca. 1785–18—)
Bowden	Wray Merrill Bowden (1914–
Buckley	Samuel Botsford Buckley (1809–1844)
Butters	Frederick King Butters (1878–1945)
Cassidy	James Cassidy (1847–1889)
Chapman	Alvan Wentworth Chapman (1809–1899)
Chase	Mary Agnes Chase (1869–1963)
Church	George Lyle Church (1903–
Clausen, R. T.	Robert Theodore Clausen (1911–
Dewey	Douglas R. Dewey (1929–
Dore	William George Dore (1912–
Drobov	Vasili Petrovich Drobov (1885–1956)
Eaton	Amos Eaton (1776–1842)
Erdman	Kimball Stewart Erdman (1937–
Fassett	Norman Carter Fassett (1900–1954)
Gattinger	Augustin Gattinger (1825–1903)
Gillett, J. M.	John Montague Gillett (1918–
Gleason	Henry Allan Gleason (1882–1975)
Gould	Frank Walton Gould (1913–
Govorukhin	Vasilii Sergeevich Govorukhin (1903–1970) (Govoruchin)*

Grabherr	Walter Grabherr (fl. 1936–1942)
Griscom	Ludlow Griscom (1890–1959)
Hackel	Eduard Hackel (1850–1926)
Henrard	Johannes Theodoor Henrard (1881–1974)
Hermann, F. J.	Frederick Joseph Hermann (1906–
Herrmann, W.	Rudolf Albert Wolfgang Herrmann (1885–
Holmgren, A. H.	Arthur Herman Holmgren (1912–
Inman	Ondess Lamar Inman (1890–1942)
Jansen	Pieter Jansen (1882–1955)
Kawano	Shoichi Kawano (1936–
Kearney	Thomas Henry Kearney (1874–1956)
Koeler	Georg Ludwig Koeler (1764–1807)
Körnicke	Friedrich August Körnicke (1828–1908) (Koernicke)*
Koyama, T.	Tetsuo Koyama (1933–
LeConte	John Eatton LeConte (1784–1860)
Lepage	Ernest Lepage (1905–
Lewis, H. F.	Harrison Flint Lewis (1893–1974)
Leysser	Friedrich Wilhelm von Leysser (1731–1815)
Michaux	André Michaux (1746–1802) (Michx)*
Mohlenbrock	Robert H Mohlenbrock (1931–
Moore, A. H.	Albert Hanford Moore (1883–
Mosher, E.	Edna Mosher (1878–1972)
Nash	George Valentine Nash (1864–1921)
Parnell	Richard Parnell (1810–1882)
Paul	Hermann Paul (1876–1964)
Pease	Arthur Stanley Pease (1881–1964)
Piper	Charles Vancouver Piper (1867–1926)
Ricker	Percy Leroy Ricker (1878–1973)
Rozhevits	Roman Yu. Rozhevits (1882–1949) (Roshevitz)*
Scribner	Frank Lamson-Scribner (1851–1938)
Senn, H. A.	Harold Archie Senn (1912–
Seymour	Frank Conkling Seymour (1895–
Shear	Cornelius Lott Shear (1865–1956)
Shinners	Lloyd Herbert Shinners (1918–1971)
Sm., J. G.	Jared Gage Smith (1866–1925)
Sørensen	Thorw(v)ald Julius Sørensen (1902–1973)
Swallen	Jason Richard Swallen (1903–
Trin.	Carl Bernhard von Trinius (1778–1844)
Trotter	Alessandro Trotter (1874–1967)
Tsvelev	Nikolai Nikolaievich Tsvelev (1925–) (Tzvelev)*
Vasey	George Vasey (1822–1893)
Voss, E. G.	Edward Groesbeck Voss (1929–
Wachter	Willem Hendrik Wachter (1882–1946)
Wagnon	Harvey Keith Wagnon (1916–
Weatherby	Charles Alfred Weatherby (1875–1949)
Weimarck, G.	Gunnar Weimarck (1936–
Wight, W. F.	William Franklin Wight (1874–1954)
Wood, A.	Alphonso Wood (1810–1881)

Appendix II

Places of publication of certain scientific names used in this work

For the place of publication of other names, *see* Hitchcock and Chase, *Manual of grasses of the United States*, ed. 2, pp. 796-980, 1951. Abbreviations of periodical publications follow the system used in *BPH: Botanico-Periodicum-Huntianum* (Lawrence et al. 1968).

Aegilops squarrosa L., Sp. Pl. 1051 (1753).

×*Agroelymus* Camus ex A. Camus, Bull. Mus. Hist. Nat. (Paris) 33:538 (1927).

×*Agroelymus hirtiflorus* (A.S. Hitchc.) Bowden, Canad. J. Bot. 37:1148 (1959): *Elymus hirtiflorus* A.S. Hitchc.

×*Agroelymus ontariensis* Lepage, Naturaliste Canad. 79:254 (1952).

×*Agrohordeum* Camus ex A. Camus, Bull. Mus. Hist. Nat. (Paris) 33:537 (1927).

×*Agrohordeum macounii* (Vasey) Lepage, Naturaliste Canad. 79:242 (1952): *Elymus macounii* Vasey.

Agropyron dasystachyum var. *psammophilum* (J.M. Gillett & H.A. Senn) E.G. Voss, Rhodora 68:437 (1966): *A. psammophilum* J.M. Gillett & H.A. Senn.

Agropyron fragile (Roth) Candargy, Arch. Biol. Veg. Athenes 1: 29, 49 (1901): *Triticum fragile* Roth.

Agropyron pectiniforme Roemer & Schultes in L., Syst. Veg. ed. 15, 2:758 (1817).

Agropyron psammophilum J.M. Gillett & H.A. Senn, Canad. J. Bot. 39:1170 (1961).

Agropyron psammophilum f. *aristatum* J.M. Gillett & H.A. Senn, Canad. J. Bot. 39:1171 (1961).

Agropyron smithii f. *molle* (Scribner & J.G. Sm.) J.M. Gillett & H.A. Senn, Canad. J. Bot. 38:750 (1960).

Agropyron trachycaulum (Link) Malte ex H.F. Lewis, Canad. Field-Naturalist 45:201 (1931): *Triticum trachycaulum* Link.

Agropyron trachycaulum var. *ciliatum* (Scribner & J.G. Sm.) Gleason, Phytologia 4:21 (1952): *A. tenerum* var. *ciliatum* Scribner & J.G. Sm.

Agropyron trachycaulum (var. *unilaterale*) f. *ciliatum* (Scribner & J.G. Sm.) Dore, Naturaliste Canad. 103:554 (1977): *A. richardsonii* var. *ciliatum* Scribner & J.G. Sm.

Agrostis capillaris L., Sp. Pl. 62 (1753).

Agrostis castellana Boiss. & Reuter, Diagn. Pl. Nov. Hisp. 26 (1842).

Agrostis gigantea var. *ramosa* (S.F. Gray) Philipson, J. Linn. Soc. Bot. 51:91 (1937): *Vilfa alba* var. *ramosa* S.F. Gray.

Agrostis hiemalis var. *tenuis* (Tuckerman) Gleason, Phytologia 4:21 (1952) (*'hyemalis'*): *A. scabra* var. *tenuis* Tuckerman.

Aira caespitosa var. *pallida* Koch, Syn. Fl. Germ. 792 (1837).

Aira macrantha Ledeb., Mém. Acad. Imp. Sci. St. Pétersbourg Hist. Acad. 5:515 (1815).

Alopecurus typhoides Burm. fil., Fl. Ind. 27 (1768).

Andropogon arundinaceus Willd., Sp. Pl. 4:906 (1806), non Bergius (1767).

Arctagrostis Griseb. in Ledeb., Fl. Ross. 4:434 (1852).

Arctagrostis arundinacea (Trin.) Beal, Grasses N. Amer. 2:317 (1896): *Vilfa arundinacea* Trin.

Arctagrostis latifolia (R. Br.) Griseb. in Ledeb., Fl. Ross. 4:434 (1852): *Colpodium latifolium* R. Br.

Arctagrostis latifolia var. *arundinacea* (Trin.) Griseb. in Ledeb., Fl. Ross. 4:435 (1852): *Vilfa arundinacea* Trin.

Arctophila Rupr. ex N.J. Andersson, Pl. Scand. Gram. x, 48 (1852).

Arctophila fulva (Trin.) N.J. Andersson, Pl. Scand. Gram. 49 (1852): *Poa fulva* Trin.

Aristida necopina Shinners, Rhodora 56:30 (1954).

Arundo australis Cav., Anales Hist. Nat. 1:100 (1799).

Avenochloa Holub, Acta Horti Bot. Prag. 1962:82 (1962).

Beckmannia syzigachne subsp. *baicalensis* (Kusn.) T. Koyama & Kawano, Canad. J. Bot. 42:879 (1964): *B. eruciformis* var. *baicalensis* Kusn.

Brachyelytrum erectum var. *glabratum* (Vasey ex Millsp.) T. Koyama & Kawano, Canad. J. Bot 42:866 (1964): *B. aristosum* var. *glabratum* Vasey ex Millsp.

Bromus ciliatus var. *genuinus* Fernald, Rhodora 32:70 (1930), nom. illeg. ≡ *B. ciliatus* var. *ciliatus* (*B. ciliatus* var. *genuinus* sensu Fernald = *B. ciliatus* var. *denudatus* (Wieg.) Fernald).

Bromus ciliatus f. *intonsus* (Fernald) Seymour, Fl. New Engl. 60 (1969): *B. ciliatus* var. *intonsus* Fernald.

Bromus danthoniae Trin. in C.A. Meyer, Verz. Pfl. Cauc. 24 (1831).

Bromus inermis subsp. *pumpellianus* (Scribner) Wagnon, Rhodora 52:210 (1950): *B. pumpellianus* Scribner.

Bromus inermis var. *purpurascens* (Hooker) Wagnon, Rhodora 52:211 (1950): *B. purgans* var. *purpurascens* Hooker.

Bromus japonicus Thunb. ex Murray in L., Syst. Veg. ed. 14, 119 (1784).

Bromus mutabilis var. *hirtus* F.W. Schultz, Flora 32:235 (1849).

Bromus pubescens f. *glabriflorus* (Wieg.) E.G. Voss, Rhodora 68:440 (1966): *B. purgans* f. *glabriflorus* Wieg.

Bromus pubescens f. *laevivaginatus* (Wieg.) Seymour, Fl. New Engl. 60 (1969): *B. purgans* f. *laevivaginatus* Wieg.

"*Bromus pungens* L.", sphalm. = *B. purgans* L.

Bromus secalinus var. *hirtus* (F.W. Schultz) Hegi, Ill. Mitteleur. Fl. 1:363 (1908); *B. mutabilis* var. *hirtus* F.W. Schultz.

Bromus tectorum f. *coloratus* Jansen & Wachter, Ned. Kruidk, Arch. 52:212 (1942).

Calamagrostis deschampsioides Trin., Sp. Gram. Icon. 3: t.354 (1836).

Calamovilfa (A. Gray) Hackel ex Scribner & Southworth, True Grasses 113 (1890).

Catabrosa aquatica var. *laurentiana* Fernald, Rhodora 35:137 (1933).

Colpodium fulvum (Trin.) Griseb. in Ledeb., Fl. Ross. 4:385 (1852): *Poa fulva* Trin.

Colpodium latifolium R. Br., Chlor. Melv. 28 (1823).

Critesion pusillum (Nutt.) A. Löve, Taxon 29(1). (1980): *Hordeum pusillum* Nutt.

Deschampsia caespitosa var. *abbei* Boivin, Naturaliste Canad. 94:523 (1967).

Deschampsia caespitosa var. *pallida* (Koch) Gren. & Godron, Fl. Fr. 3:507 (1856): *Aira caespitosa* var. *pallida* Koch.

Deschampsia caespitosa f. *pallida* (Koch) Holmberg, Skand. Fl. 2:166 (1926): *Aira caespitosa* var. *pallida* Koch.

Dupontia R. Br., Chlor. Melv. 32 (1823).

Dupontia fisheri R. Br., Chlor. Melv. 33 (1823).

Dupontia fisheri var. *aristata* Malte ex Polunin, Bull. Natl. Mus. Canada 92:80 (1940).

Dupontia fisheri f. *aristata* (Malte ex Polunin) Lepage, Naturaliste Canad. 81:256 (1954): *D. fisheri* var. *aristata* Malte ex Polunin.

Dupontia fisheri subsp. *psilosantha* (Rupr.) Hultén, Acta Univ. Lund. ser. 2, 38:226 (1942): *Dupontia psilosantha*

Dupontia fisheri var. *psilosantha* (Rupr.) Trautv., Trudy Imp. S. Petersburgsk. Bot. Sada 10:542 (1889): *Dupontia psilosantha*

Dupontia psilosantha Rupr., Fl. Samoj. Cisural. 64, pl. 6 (1845). ≡ *Poa psilosantha* Rupr.

Echinochloa wiegandii (Fassett) McNeill & Dore, Naturaliste Canad. 103:557 (1977): *E. pungens* var. *wiegandii* Fassett.

Elymus arenarius L., Sp. Pl. 83 (1753).

Elymus canadensis var. *albanensis* Lepage, Naturaliste Canad. 79:178 (1952).

Elymus canadensis var. *wiegandii* (Fernald) Bowden, Canad. J. Bot. 42:574 (1964): *E. wiegandii* Fernald.

Elymus hystrix f. *bigelovianus* (Fernald) Dore, Naturaliste Canad. 103:557 (1977).

Elymus lanceolatus subsp. *psammophilus* (J. M. Gillett & H. A. Senn) A. Löve, Taxon 29(1). (1980): *Agropyron psammophilum* J. M. Gillett & H. A. Senn.

Elymus ×*maltei* Bowden, Canad. J. Bot. 42:575 (1964).

Elymus trachycaulus (Link) Gould ex Shinners, Rhodora 56:28 (1954): *Triticum trachycaulum* Link.

Elymus trachycaulus subsp. *major* (Vasey) Tsvelev, Nov. Sist. Vyssh. Rast. 10:24 (1973): *Agropyron violaceum* var. *majus* Vasey.

Elymus trachycaulus subsp. *novae-angliae* (Scribner) Tsvelev, Nov. Sist. Vyssh. Rast. 10:23-24 (1973): *Agropyron novae-angliae* Scribner.

Elymus trachycaulus subsp. *subsecundus* (Link) A. & D. Löve; Bot. Not. 128:502 (1976): *Triticum subsecundum* Link.

Elymus trachycaulus subsp. *violaceus* (Hornem.) A. & D. Löve, Bot. Not. 128:502 (1976): *Triticum violaceum* Hornem.

Elymus virginicus var. *jenkinsii* Bowden, Canad. J. Bot. 42:583 (1964).

Elytrigia dasystachya (Hooker) A. & D. Löve, Bull. Torrey Bot. Club 81:33 (1954): *Triticum repens* var. *dasystachyum* Hooker.

Elytrigia smithii (Rydb.) A. Löve, Bot. Not. 1950:31 (1950): *Agropyron smithii* Rydb.

Eragrostis cilianensis (All.) Lutati ex Hubbard, Philipp. J. Sci. C. Bot. 8:159 (1913): *Poa cilianensis* All.

Festuca altaica Trin. in Ledeb., Fl. Altaica 1:109 (1829).

Festuca altaica var. *major* (Vasey) Gleason, Phytologia 4:21 (1952): *F. scabrella* var. *major* Vasey.

Festuca baffinensis Polunin, Bull. Natl. Mus. Canada 92:91 (1940).

Festuca longifolia Thuill., Fl. Paris. ed. 2,50 (1799).

Festuca longifolia f. *villosa* (Schrader) Dore, Naturaliste Canad. 103:560 (1977): *F. ovina* var. *villosa* Schrader.

Festuca obtusa f. *pilosifolia* Dore, Naturaliste Canad. 103:560 (1977).

Festuca ovina var. *saximontana* (Rydb.) Gleason, Phytologia 4:21 (1952): *F. saximontana* Rydb.

Festuca ovina subsp. *tenuifolia* (Sibth.) Arcangeli, Comp. Fl. Ital. 791 (1882): *F. tenuifolia* Sibth.

Festuca ovina var. *tenuifolia* (Sibth.) Dumort., Obs. Gram. Fl. Belg. 102 (1823): *F. tenuifolia* Sibth.

Festuca ovina (var. *duriuscula*) subvar. *trachyphylla* Hackel, Monogr. Festuc. Eur. 91 (1882).

Festuca ovina (subsp. *duriuscula*) var. *villosa* Schrader, Fl. Germ. 1:320 (1806).

Festuca prolifera var. *lasiolepis* Fernald, Rhodora 35:133 (1933).

Festuca rubra var. *alaica* Drobov, Trudy Bot. Muz. Imp. Akad. Nauk 16:135 (1916).

Festuca rubra subsp. *arctica* (Hackel) Govorukhin, Fl. Urala 127 (1937): *F. rubra* f. *arctica* Hackel.

Festuca rubra (subsp. *eu-rubra* var. *genuina* subvar. *arenaria*) f. *arctica* Hackel, Monogr. Festuc. Eur. 140 (1882).

Festuca rubra subsp. *fallax* (Thuill.) Nyman, Consp. 827 (1882): *F. fallax* Thuill.

Festuca rubra var. *genuina* Hackel, Monogr. Festuc. Eur. 138 (1882): nom. illeg. = var. *rubra*.

Festuca rubra (var. *rubra*) f. *glaucescens* (Fries ex Hartman) Holmberg, Skand. Fl. 2:236 (1926).

Festuca rubra var. *juncea* (Hackel) Richter, Pl. Eur. 1:99 (1890): *F. rubra* subvar. *juncea* Hackel.

Festuca rubra (subsp. *eu-rubra* var. *genuina*) subvar. *juncea* Hackel, Monogr. Festuc. Eur. 139 (1882).

Festuca rubra (subsp. *richardsonii* var. *prolifera*) f. *lasiolepis* (Fernald) A. & D. Löve, Univ. Colorado Stud. Ser. Biol. 24:12 (1966): *F. prolifera* var. *lasiolepis* Fernald.

Festuca rubra megastachys Gaudin, Fl. Helv. 1:287 (1828).

Festuca rubra var. *megastachys* (Gaudin) Hegi, Ill. Fl. Mitteleur. 1:341 (1908): *F. rubra megastachys* Gaudin.

Festuca rubra f. *megastachys* (Gaudin) Holmberg, Skand. Fl. 2:236 (1926): *F. rubra megastachys* Gaudin.

Festuca rubra (var. *prolifera*) f. *prolifera* (Piper) Hylander, Uppsala Univ. Arsskr. 1945 (7):83 (1945); the typical form of var. *prolifera* (Piper) Piper ex Robinson, Rhodora 10:65 (1908), cf. also f. *lasiolepis* above.

Festuca rubra var. *squarrosa* Fries ex Hartman, Handb. Skand. Fl. 60 (1820).

Festuca rubra (var. *rubra*) f. *squarrosa* (Fries ex Hartman) Holmberg, Skand. Fl. 2:236 (1926): *F. rubra* var. *squarrosa* Fries ex Hartman.

Festuca rubra var. *vulgaris* Gaudin, Fl. Helv. 1:285 (1828), nom. illeg. ≡ var. *rubra*.

Festuca tenuifolia Sibth., Fl. Oxon. 44 (1794).

Festuca trachyphylla (Hackel) Krajina, Acta Bot. Bohem. 9:190 (1930): *F. ovina* subvar. *trachyphylla* Hackel.

Glyceria arundinacea (Bieb.) Kunth, Rev. Gram. 1:118 (1829): *Poa arundinacea* Bieb.

Glyceria maxima (Hartman) Holmberg, Bot. Not. 1919:97 (1919): *Molinia maxima* Hartman.

Glyceria ×ottawensis Bowden, Canad. J. Bot. 38:127 (1960).

Glyceria plicata Fries, Nov. Fl. Suec. Mant. 2:6 (1839).

Glyceria spectabilis Mert. & Koch in Röhling, Deutschl. Fl. ed. 3, 1:586 (1823).

Hierochloë alpina subsp. *orthantha* (Sørensen) G. Wiemarck, Bot. Not. 124:161 (1971): *H. orthantha* Sørensen.

Hierochloë hirta (Schrank) Borbás, Balaton Növenyföldr. 2:315 (1900): *Savastana hirta* Schrank.

Hierochloë hirta subsp. *arctica* (C. Presl) G. Weimarck, Bot. Not. 124:150 (1971): *H. arctica* C. Presl.

Hierochloë monticola (Bigelow) A. & D. Löve, Taxon 13:201 (1964): *Holcus monticola* Bigelow.

Hierochloë odorata subsp. *hirta* (Schrank) Tsvelev, Nov. Syst. Pl. Vasc. (Leningrad) 10:81 (1973): *Savastana hirta* Schrank.

Hierochloë orthantha Sørenson, Meddel. Grønland 136 (8):3 (1954).

Hierochloë pauciflora R. Br., Chlor. Melv. 35 (1823).

Hierochloë pauciflora f. *setigera* Lepage, Naturaliste Canad. 81:255 (1954).

Hordeum geniculatum All., Fl. Pedem. 2:259 (1785).

Hordeum jubatum subsp. *breviaristatum* Bowden, Canad. J. Bot. 40:1690 (1962): *H. boreale* Scribner & J.G. Sm.

Hordeum jubatum subsp. ×*intermedium* Bowden, Canad. J. Bot. 40:1686 (1962): *H. caespitosum* Scribner.

Koeleria macrantha (Ledeb.) Schultes in L., Syst. Veg. ed. 15, Mantissa 2:345 (1824): *Aira macrantha* Ledeb.

Koeleria pyramidata (Lam.) Beauv., Essai Agrost. 166, 175 (1812): *Poa pyramidata* Lam.

Leptochloa acuminata (Nash) Mohlenbrock, Illustr. Fl. Illinois, Grasses [2] *Panicum* to *Danthonia*: 294 (1973): *Diplachne acuminata* Nash.

Leptochloa fascicularis var. *acuminata* (Nash) Gleason, Phytologia 4:21 (1952): *Diplachne acuminata* Nash.

Leymus arenarius (L.) Hochst., Flora 31:118 (1848): *Elymus arenarius* L.

Lolium perenne var. *aristatum* Willd., Sp. Pl. 1:462 (1797).

Lolium temulentum var. *arvense* Liljeblad, Utkast Svensk Fl. ed. 3, 80 (1816).

Milium effusum var. *cisatlanticum* Fernald, Rhodora 52:218 (1950).

Molinia arundinacea Schrank, Baier Fl. 1:336 (1789).

Molinia arundinacea var. *litoralis* (Host) Grabherr, Mitt. Forstwist. Forstwissen. 13:193 (1942): *M. litoralis* Host.

Molinia caerulea subsp. *litoralis* (Host) Paul, Ber. Bayer. Bot. Ges. 22:16, 18 (1937): *M. litoralis* Host.

Molinia litoralis Host, Fl. Aust. 1:118 (1827).

Molinia maxima Hartman, Handb. Skand. Fl. 56 (1820).

Panicum bicknellii var. *calliphyllum* (Ashe) Gleason, Phytologia 4:21 (1952): *P. calliphyllum* Ashe.

Panicum columbianum var. *commonsianum* (Ashe) Dore, Naturaliste Canad. 103:562 (1977).

Panicum columbianum var. *siccanum* (A.S. Hitchc. & Chase) Boivin, Naturaliste Canad. 94:526 (1967).

Panicum depauperatum f. *cryptostachys* Fernald, Rhodora 23:194 (1921).

Panicum depauperatum var. *perlongum* (Nash) Boivin, Naturaliste Canad. 94:526 (1967).

Panicum glaucum B. *pumilum* (Poiret) Ascherson & Graebner, Syn. Mitteleur. Fl. 2(1):78 (1899): *P. pumilum* Poiret.

Panicum lanuginosum var. *praecocius* (A.S. Hitchc. & Chase) Dore, Naturaliste Canad. 103:562 (1977).

Panicum leibergii var. *baldwinii* Lepage, Naturaliste Canad. 86:67 (1959).

Panicum pumilum Poiret in Lam., Encycl. Suppl. 4:273 (1816).

Panicum viride f. *pygmaeum* Ascherson & Graebner, Syn. Mitteleur. Fl. 2(1):77 (1899).

Panicum viride var. *viviparum* Bertol., Fl. Ital. 1:421 (1834).

Pennisetum typhoides (Burm. fil.) Stapf & C.E. Hubbard, Kew Bull. 1933:271 (1933): *Alopecurus typhoides* Burm. fil.

Phalaris arundinacea f. *variegata* (Parnell) Druce, Fl. Berks. 556 (1897): *P. arundinacea* var. *variegata* Parnell.

Phleum commutatum Gaudin, Alpina 3:4 (1808).

Phleum pratense f. *bracteatum* A. Braun ex Ascherson & Graebner, Syn. Mitteleur. Fl. 2(1):142 (1899).

Phleum pratense f. *viviparum* (S.F. Gray) Louis-Marie, Rev. Oka Agron. Inst. Agric. 14:144 (1940).

Phragmites australis (Cav.) Trin. ex Steudel, Nomencl. Bot. ed. 2, 2:324 (1841): *Arundo australis* Cav.

Phragmites communis subsp. *berlandieri* (E. Fourn.) A. & D. Löve, Bull. Torrey Bot. Club 81:33 (1954): *P. berlandieri* E. Fourn.

Poa agassizensis Boivin & D. Löve, Naturaliste Canad. 87:176 (1960).

Poa alpigena (Fries) Lindman, Svensk Fanerogamfl. 91 (1918): *P. pratensis* var. *alpigena* Fries.

Poa arundinacea Bieb., Fl. Taur.-Cauc. 1:60 (1808), non Moench (1794).

Poa canbyi (Scribner) Howell, Fl. N.W. Amer. 1:764 (1903): *Glyceria canbyi* Scribner.

Poa fulva Trin., Mém. Acad. Imp. Sci. St. Pétersbourg, Sér. 6, Sci. Math. 1:378 (1830).

Poa phryganodes Trin., Mém. Acad. Imp. Sci. St. Pétersbourg, Sér. 6, Sci. Math. 1:389 (1830).

Poa pratensis var. *alpigena* Fries, Herb. Norm. Fasc. 9:93 (1842); ex Blytt, Norges Fl. 130 (1861).

Poa pratensis var. *angustifolia* (L.) Wahlenb., Fl. Lapp. 41 (1812): *P. angustifolia* L. (apparently the first valid publication at varietal rank).

Poa psilosantha Rupr., Fl. Samoj. Cisural. 64, (1845) ≡ *Dupontia psilosantha* Rupr.

Poa pyramidata Lam., Tabl. Encycl. Méth. Bot. 1:183 (1791).

Puccinellia fernaldii (A.S. Hitchc.) E.G. Voss, Rhodora 68:445 (1966): *Glyceria pallida* var. *fernaldii* A.S. Hitchc.

Puccinellia laurentiana Fernald & Weatherby, Rhodora 18:14 (1916).

Puccinellia lucida Fernald & Weatherby, Rhodora 18:16 (1916).

Puccinellia macra Fernald & Weatherby, Rhodora 18:15 (1916).

Puccinellia nuttalliana (Schultes) A.S. Hitchc. *in* Jepson, Fl. Calif. 1:162 (1912): *Poa nuttalliana* Schultes.

Puccinellia ×*phryganodes* (Trin.) Scribner & Merr., Contr. U.S. Natl. Herb. 13:78 (1910), pro sp.: *Poa phryganodes* Trin.

Rhaphis arundinaceus Desv., Opusc. 69 (1831), (≡ *Andropogon arundinaceus* Willd., nom. illeg.).

Savastana hirta Schrank, Baier. Fl. 1:337 (1789).

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Setaria viridis var. *vivipara* (Bertol.) Parl., Fl. Ital. 1:112 (1850): *Panicum viride* var. *viviparum* Bertol.

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Zizania palustris var. *interior* (Fassett) Dore, Wild-rice 20 (1969): *Z. aquatica* var. *interior* Fassett.

Zizania palustris (var. *palustris*) f. *purpurea* Dore, Naturaliste Canad. 103:565 (1977).

Appendix III

Basic manuals relevant to the grasses of Ontario

Fernald, M. L. 1950. Gray's manual of botany. 8th ed. American Book Co., New York, N.Y. 1632 pp.

A fairly critical account of the flowering plants and ferns of the central and northeastern United States and adjacent Canada; the Gramineae (family 22) are on pages 94–236. Keys, descriptions, and a summary of distribution are provided, but the only illustrations are small sketches of diagnostic features of some species. Republished with corrections, 1970, by Van Nostrand and Reinhold Co., New York, N.Y.

Gleason, H. A. 1952. The new Britton and Brown illustrated flora of the northeastern United States and adjacent Canada. New York Botanical Garden, Bronx, N.Y. 3 vols. 482, 655, and 596 pp.

A flora covering a similar area to the above but with each species illustrated and with a slightly broader species concept and fewer infraspecific taxa; the Gramineae are in Vol. 1, pp. 96–246. Republished with slight revisions, 1968, by Hafner Press, New York and London.

Gleason, H. A., and Cronquist, A. 1963. Manual of the vascular plants of the northeastern United States and adjacent Canada. D. Van Nostrand Co., New York, N.Y. 810 pp.

Essentially a condensed version of the preceding with some revision and without any illustrations; the Gramineae are on pages 45–120.

Hitchcock, A. S., and Chase, A. 1951. Manual of the grasses of the United States. 2nd ed. U.S. Dep. Agric. Misc. Publ. 200. 1051 pp.

A detailed floristic account of the grass species of the contiguous United States and covering almost all those found in Ontario with the exception of some arctic species confined to the extreme north. Keys and descriptions are provided and a large number of species are illustrated; detailed synonymy, with place of publication, is provided in an appendix, on pages 796–980. This second edition is a revision by Agnes Chase of A. S. Hitchcock's 1935 edition.

Polunin, N. 1959. Circumpolar arctic flora. Clarendon Press, Oxford. 514 pp.

Although the limits of the arctic set by Polunin exclude Ontario, some characteristically arctic species extend to the shores of Hudson Bay and James Bay. This flora, which employs a broad species concept, is useful for these species; the Gramineae are on pages 30–75.

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A complete listing of grasses (pages 84-101) with notes and localities, but not segregated as to province.

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Baum, B. R., and Findlay, J. N. 1973. Preliminary studies in the taxonomy of *Danthonia* in Canada. Can. J. Bot. 51:437-450.

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Plants collected by Bell, identified by Billings; 24 species of Gramineae, mostly from Ontario but some reported only from localities in Michigan.

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Forty-seven species of the Gramineae listed on pages 133-134, some with localities; for details, *see* Dore (1962).

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Page 8, *Agrostis tenuis* in Ontario.

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Pages 9-13, *Echinochloa, Setaria vertillata* and *Agropyron repens* in Ontario.

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Pages 4-10, eight grasses of Ontario reviewed.

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